SWAMI VIVEKANAND UNIVERSITY, SIRONJA, SAGAR (M.P.)

SYLLABUS

For

B.Tech Safety & Fire Engineering

Swami Vivekanand University, Sironja Sagar
2013-2014

B.TECHDEGREECOURSEIN SAFETY&FIREENGINEERING

(W. e. f. 2013-14)

SCHEME OF EXAMINATIONS AND SYLLABUS

B.TECHDEGREECOURSEINSAFETY&FIREENGINEERING

Scheme of Examinations

SEMESTERI&II(Commontoallbranches)

CodeNo.	Subject	Hrs/week L	T/D/P	Int	Univ	Total
CE/CS/EB/EC/EE/ EI/IT/ME/SE101	EngineeringMathematics-I	3		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE102	EngineeringPhysics	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE103	EngineeringChemistry	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE104	EngineeringMechanics	3	1	50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE105	EngineeringGraphics	1	3	50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE106	BasicCivilandMechanical Engineering	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE107	BasicElectricalEngineering andElectronics	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE108	ComputerProgramming	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE109	TechnicalCommunicationand Social Sciences	3*		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE110	ComputerProgramming Laboratory	-	3	100	-	100
CE/CS/EB/EC/EE/ EI/IT/ME/SE111	ElectricalandMechanical Workshop	-	3	100	-	100
	TOTAL	20	10	650	900	1550

*1hour/weekforEnvironmentalStudies.

SEMESTERIII

CodeNo.	Subject	Hrs/week L	T/D/P	Int.	Univ	Total
CE/CS/EB/EC/EE/ EI/IT/ME/SE301	Eng.Mathematics-II	4	-	50	100	150
SE 302	ChemicalEngineering	4	-	50	100	150
SE 303	FluidMechanicsand FluidFlowMachines	4	-	50	100	150
SE 304	ManufacturingProcesses	4	-	50	100	150
SE 305	Elementsof MachineDrawing	1	3	50	100	150
SE 306	PrinciplesofSafety Management	4	-	50	100	150
SE 307	MachineShop	-	3	100	-	100
SE 308	FluidMechanics& MachineryLab	-	3	100	-	100
	TOTAL	21	9	500	600	1100

SEMESTERIV

CodeNo.	Subject	Hrs/week L	T/D/P	Int.	Univ	Total
CE/CS/EB/EC/EE/ EI/IT/ME/SE401	Eng. Mathematics-III	4	-	50	100	150
SE 402	ChemicalEngineeringII	4	-	50	100	150
SE 403	StrengthofMaterials	4	-	50	100	150
SE 404	FireEngineering	4	-	50	100	150
SE 405	Electrical Technologyand SafetyinElectricalSystems	4	-	50	100	150
SE 406	FirstAidandEmergency Procedures	4	-	50	100	150
SE 407	StrengthofMaterialslab	-	3	100	-	100
SE 408	ElectricalTechnologyLab	-	3	100	-	100
	TOTAL	24	6	500	600	1100

SEMESTERV

CodeNo.	Subject	Hrs/week L	T/D/P	Int	Univ	Total
CE/CS/EB/EC/EE/ EI/IT/ME/SE501	Eng. Mathematics IV	4	-	50	100	150
SE 502	ChemicalEngineeringIII	4	-	50	100	150
SE 503	PrinciplesofEngineering Design	4	-	50	100	150
SE 504	FireEngineering	4		50	100	150
SE 505	Principlesof Industrial Management	4	-	50	100	150
SE 506	SafetyinConstruction	4		50	100	150
SE 507	SafetyEngineeringLab	-	3	100	-	100
SE 508	ChemicalEngineeringLab	-	3	100	-	100
	TOTAL	24	6	500	600	1100

SEMESTERVI

CodeNo.	Subject	Hrs/week L	T/D/P	Int	Univ	Total
SE 601	LegalAspectsofSafety,Health andEnvironment	4	-	50	100	150
SE 602	ChemicalProcessSafety	4	-	50	100	150
SE 603	ProcessInstrumentationand ControlEngineering	4	-	50	100	150
SE 604	FireEngineeringIII	4	-	50	100	150
SE 605	EnvironmentalEngineeringand Management	4	-	50	100	150
SE 606	OccupationalHealth&Hygiene Management	4	-	50	100	150
SE 607	EnvironmentalEngineering&M anagementLab	-	3	100	-	100
SE 608	MinorProject	-	3	100	-	100
	TOTAL	24	6	500	600	1100

SEMESTER VII

CodeNo.	Subject	Hrs/week L	T/D/P	Int	Unit	Total
SE 701	HazardIdentificationand RiskAssessment	4	-	50	100	150
SE 702	SafetyinRailandRoadTransport	4	-	50	100	150
SE 703	SafetyinEngineeringIndustry	4	-	50	100	150
SE 704	FireEngineeringIV	4	1	50	100	150
SE 705	Elective	4	-	50	100	150
SE 706	FireEngineeringLab	-	3	100	-	100
SE 707	IndustrialHygienelab	-	3	100	-	100
SE 708	Seminar	-	3	100	-	100
	TOTAL	20	10	550	500	1050

SE705 ELECTIVE-I
(A)AutomobileEngineeringandSafety
(B) Safety inPetroleumandPetrochemicalIndustries(C)
Food andBiosafety
(D)FaultDetectionandDiagnosis

SEMESTER VIII

CodeNo.	Subject	Hrs/week L	T/D/P	Int	Unit	Total
SE 801	HumanFactorsEngineering	4	1	50	100	150
SE 802	DisasterManagement	5	-	50	100	150
SE 803	AdvancedSafetyEngineeringand Management	5	-	50	100	150
SE 804	Elective–II	5	-	50	100	150
SE 805	Project	-	10	300	-	300
SE 806	VivaVoce	-	-	-	100	100
	TOTAL	19	11	500	500	1000
	GRANDTOTAL			3700	4300	8000

SE804ELECTIVE-II
(A)SafetyinPowerPlants
(B)SafetyinHealth-CareWasteManagement
(C)FluidPowerSafety
(D)TotalQualityManagement

101ENGINEERINGMATHEMATICSI

MODULEI

Ordinary differentialquestions:

First order differential equations-Methods of solution and Simple applicationsLinear differentialquestionsofhigherorderswith constantco-efficient-Methodsofsolutionofthese equations.Cauchy'sLineardifferentialequations.Simultaneouslinear differentialquestions- Simple applications of linear differential equations in engineering problems - ElectricalCircuits,MechanicalSystems

MODULEII

Infinite series:Integraltest,comparisontest,ratiotest,Cauchy'sroottest,Raabe'stest,series of positive and negative terms, concept of absolute convergence, alternating series, Leibniz test(Noproofsforanyoftheabovetests)Powerseries:Internalofconvergenceofpower series, Taylorand Maclaurinseriesoffunction's.

Leibnizformulaforthenthe derivativeoftheproduce totwo functions(Noproof),useofLeibniz formulaforthedeterminationofco-efficientofthepowerseries.

MODULEIII

Partialdifferentiation:Partialdifferentiation-Conceptofpartialderivative- Chainrule- Total derivative-Euler'stheoremforhomogeneousfunctions,Differentialsandtheirapplicationsinerrors andapproximations,Jacobeans – Maximaminim afunctionsoftwovariables(Proofof the result notrequired)-Simpleapplications.

Taylor's seriesexpansionforafunctionontwo variables-Simpleproblems

Co-ordinate systems: Rectangular co-ordinates-Polar co-ordinates-In plane and in SpaceCylindrical polar co-ordinates-Sphericalpolarcoordinates

MODULEIVInte

gralcalculus:

Applicationofdefiniteintigress:Area,Volume,Arclength,Surfacearea.

ImproperIntegrals-Beta function-Gammafunction multipleintegrals: Evaluationofdouble integrals-Changeoforderofintegration. Evaluation of triple integrals-Change ofVariables in integrals.

Applicationsof multipleintegralsPlane AreaSurface area &Volumesofsolids

References

1. MathematicalTechniques:Oxford UniversityPress
2. Engineering Mathematics:T.Veerarajan,TMGHPublishers
3.HigherEngineeringMathematics:B.S.Growl,KhannaPublishers
4. Engineeringmathematics -Vol1:S.S.Sastry,PHI publishers Advanced Engineering Mathematics:Erwin Kreyzig,WileyEastern

TypeofQuestionsforUniversityExam.

Q1.Eightshortanswerquestionsof5markswithtwoquestionsfromeachofthefourmodules.

Q2.toQ.5:TwoquestionsA&Bof15marksfromeachmoduleswithoptiontoanswereitherA&B.

102: ENGINEERINGPHYSICS

ModuleI:

Interferenceoflight-Michelsoninterferometer-Applications-Interferenceinthinfilms Antireflectioncoatings-Interferencefilters- Fringesproducedbyairwedge-Testingofflatsurfaces-Diffractionoflight-Zoneplate-Planediffractiongrating-Reflectionand Transmissiongratings-Determinationofwavelengthoflight-Dispersiveandresolvingpowers - Polarizationoflight- Doublerefraction- Nicol'sprism –Quarterand halfwaveplates –Ellipticallyand circularlypolarizedlight-Opticalactivity-Specificrotation-Halfshadepolarimeter Applicationsofpolarizedlight.

ModuleII:

LasersandHolography-Propertiesoflaserlight-Coherenceoflight-Principlesoflaser action - Population inversion -Optical pumping -Metastable states -Conditions forlaser action Types of lasers - Helium-Neon, Ruby and Semiconductor lasers - Applications of lasers Principles of holography - Recording and Reconstruction of holograms - Applications ofholography-Fiber optics–Lighttransmissionthroughopticalfiber-Numerical aperture- Multiandsinglemodefibers-Stepindexandgradedindexfibers-Fiberdrawing-Fiber opticcommunication(basicideas)-Ultrasonics-Generationofultrasonic waves-
Applicationsof Ultrasound.

ModuleIII:

Quantummechanics-Heisenberg'suncertaintyprinciple -Experimental illustrations - Quantum mechanical wave equation - Time independent Schrodinger equation - Physical significance of wave function - Properties of the wave function - Solution of Schrodinger equation - Atomic and nuclear physics - The Vector atom model- Quantization of orbital angularmomentum-Electronspin-Magneticmomentoforbitalelectron-Pauli'sexclusion principle-Zeeman effect - Stark effect -Raman effect. Nuclear physics - Nuclear forces - Propertiesofthe nucleus-Nuclearreactions-Nuclear reactioncross-section-Artificial
Radioactivity -Nuclearreactors -Nuclearfusion -Thermonuclear reactions-Controlled Thermonuclear
reactions.

ModuleIV:

X-rays -Production of X-rays -Origin of X-rays and X-ray spectra -Moseley's law –PropertiesofX-rays- ApplicationsofX-rays- DiffractionofX-raysbycrystals- Bragg'slawCrystallography- Unitcell – Sevencrystalsystems- Bravaisspacelattices- PackingfactorLattice planesandMillerindices-Energybandsinsolids-Conductors,semiconductorsandinsulators- Intrinsic and extrinsic semiconductors - Conductivity of semiconductors - Fermi level - Applicationsofsemiconductors - p-injunctions-solar cells-Halleffectanditsapplications- Superconductivity-Superconductingtransition- TheMeisseneffect-Typeand Typedsuperconductors-Isotopeeffect-Hightemperaturesuperconductors-Josephsoneffect- SQUIDS- Applicationsofsuperconductors

References

J.JacobPhilip-AtextbookofEngineeringPhysics,EducationalPublishersandDistributors 2002
2. A.S. Vasudeva -ModernEngineeringPhysics.Chand&Co.
3.M.R.Serene vacant-PhysicsforEngineers-NewAgeInternational

TypeofQuestionsforUniversityExam.

Q1.Eightshortanswerquestionsof5markswithtwoquestionsfromeachofthefourmodules.
Q2.toQ.5:TwoquestionsA&Bof15marksfromeachmoduleswithoptiontoanswereitherA&B.

103ENGINEERINGCHEMISTRY

Module I

Solid state chemistry: Fundamentals, Bonding in solids, Born-Haber cycle, Point defects, Methodstoimprovereactivityof solids,Free electron theory ,Band theory,Fertile veinsemiconductors,MoleClearfield theoryof magneticmaterials,Conventionalandorganic superconductors, High temperature superconductors, Liquid crystals, Applications. Solid surfacecharacterization:Electronspectoris copy forchemicalanalysis,Chemical shift,BETisotherm,Thermodynamicsofadsorption.

ModuleII

Electrochemistry:Fundamentals,Electrode potentials,Types ofelectrodes, SaltBridge,elfmeasurement. Concentration cells, Acids and bases, Buffer solutions, ph measurements,
Polarization,Overvoltage.Powergeneration:Secondarycells,Fuelcells,Photovoltaic effect, Solar cells.Corrosion: Differentformsofcorrosion,Preventionofcorrosion.
ChemicalKinetics:reactionrate, ratecontain,ratelaw, reaction order,firstorder,second Order, pseudo-firstorderreactions, integratedratelaws,half-lifeof are action and itsrelationtorateconstantMoleclarity,
simpleunimolecularandbimolecularreactions.Arrheniusequation.
Fastreactions – flashphotolysis, flow techniques and relaxation methods.

Module III

Chemical Thermodynamics: Fundamentals, Molecular interpretation of internal energy, enthalpy and entropy, Heat of reaction, Kirchhoff'sequation, Crouton'srule, Entropy changesaccompanying differentprocesses,Nernstheat theorem,Third-law. Freeenergy: Dependence on pressure and temperature, Gibbs-Helmholtz equation, Free energy changes and equilibrium constant, Chemical potential, Fugacity, Thermodynamics of biochemical reactions.

ModuleIV

Engineering materials: Industrial polymers-polymerization techniques, structure- property relationships,polymeradditives,polymerprocessing methods(extrusion,injection, compression, transfer and blow molding methods). Nanmaterials: definition, classification andapplications.
Nanmetalsandanon ceramics-examplesandproperties.
Lubricants:classification,functionsandproperties.Mechanicsmoflubrication.
Refractoriness:classification andproperties.Portlandcement,limeandplasterofParis manufacture,settingandhardening.
Chemistryofopticalfibers, full arenasandoregano electronicmaterials(introduction only).

TextBooks

1. PeterAtkins and Julio Paula Elements ofPhysicalChemistry,OxfordUniversity Press,2005
2. Shahs Chawla ATextBookofEngineeringChemistry(3rd eddo.). DhanpatRay & Co, NewDelhi,2003.

References

1. Atkins, P.W.PhysicalChemistry,Oxford UniversityPress,UK,1998
2. Bhavnagar, M.S.TextbookofPure&AppliedPhysicalChemistry,A.H.Wheeler&Co,New Delhi 1999.
3. Geoffrey Oozing, Andre ArsenaultNan chemistry: AChemicalApproach to Nan materials. RoyalSocietyofChemistry, U.K.2005.

TypeofQuestionsforUniversityExam.

Q1.Eightshortanswerquestionsof5markswithtwoquestionsfromeachofthefourmodules.
Q2.toQ.5:TwoquestionsA&Bof15marksfromeachmoduleswithoptiontoanswereitherA&B

104 ENGINEERINGMECHANICS

A)STATICS

MODULE I

Concurrentforceseaplane:Principles ofstatics.Compositionandresolutionofforces. Equilibriumofconcurrentforcesinaplane. Method ofprojection. Method ofmoments.Friction. Parallelforceseaplane:Twoparallelforces.Generalcaseofparallelforcesinaplane.Centreofparallel forcesandcentreofgravity Pappas theorems,cancroids ofcompositely anfigures andcurves. Distributedforceseaplane.

MODULE II

Propertiesofareas: Momentofinertiaofaplanefigurewithrespecttoanaxisnits plane.Polar momentofinertia.Productofinertia.Principalaxes.Massmomentofinertiaofmaterialbodies. Generalcaseoffarcsine plane:Compositionofforces inaplane.Equilibrium offorces inaplane.Plane trusses-Methodofjoints.Methodofsections.Planeframes:Methodofmembers.Principleofvirtualwork: Equilibriumofideal systems, stable and unstableequilibrium.

B)DYNAMICS

MODULE III

Rectilineartranslation: Kinematicsofrectilinearmotion.Differentialequationofrectilinearmotion.Motion Ofaparticleacteduponbyaconstantorca,bay forceas function timeandbyaforce proportionaltodisplacement. Simpleharmonicmotion.D'Alamberts'sprinciple.Momentumand impulse.Workandenergy,Idealsystems,conservationofenergy.Impact.

MODULE IV

Curvilinear translation:Kinematicsofcurvilineartranslation.Differentialequationsofmotion. Motion of a project D' Alembert's' principleincursinearmotion.Momentofmomentum.Workandenergycurvilinearmotion. Rotate onof a rigid body: Kinematicsofrotation.Equationofmotionofarigidbodyrotatingaboutafixed axis.Rotationundertheactionofaconstantmoment.Compoundpendulum.Generalcaseof Moment proportionaltotheangle Resultant inertia ofrotation.D'Alembert's principle of rotation. For inrotation. Principle of angular moment um in rotation . Energyquestionorrotating bodies.

REFERENCESS

1. Engineering Mechanics-TimoshenkoandYoung-McGraw Hill Book Company.
2. MechanicsforEngineers(Vol.1-StaticsandVol.2-Dynamics)-Beer F.P. & Johnstone E. R. -Tata McGraw Hill.
3.EngineeringMechanics (Vol.1-StaticsandVol.2-Dynamics)-MerriamH.L.&K rage.G. JohnWileandSons.
4. Engineeringmechanics-Bijou N– EducationalPublications-

TypeofQuestionsforUniversity Exam.

Q1: Eightshortanswerquestionsof5markswithtwoquestionsfromeachofthefourmodules.
Q2.toQ.5:TwoquestionsA&Bof15marksfromeachmoduleswithoptiontoanswereitherA&B

105 ENGINEERING GRAPHICS

MODULEI

Introduction toengineeringgraphics. Drawing strumpetsandtheiruse.Familiarizationwithcurrent IndianStandardCodeofPracticeforgeneralengineeringdrawing.
Scales-plainscale,venirescale,diagonalscale.
Conic sections- Construction of ellipse, parabola, hyperbola - construction of cycloid, involute, archimedianspiralandlogarithmicspiral-drawingtangentsandnormal'stothesecures.

MODULEII

Introductiontoorthographicprojectionsplaneofprojection-principlesuffer sting eland thirdangle projections,projectionofpointsin differentquadrants.
Orthographicprojectionofstraightlineparalleltooneplaneand inclinedother the plane-straight linesinclinedtoboththeplanes-truelengthandinclinationoflineswithreferenceplanes-tracesof lines.
Projectionofplanelaminate ofgeometricalshapes in oblique positions.

MODULEIII

Projectionofpolyhedralandsolidsorevolution- frustum,projectionofsolidswithaxis parallel to one planeand parall eloper pendeclaretootherplane-projection ofsolidswithaxisinclinedtoboththeplanes-projectionofsolidsonauxiliaryplanes.
Sectionofsolidsbyplanes inclined tohorizontalor vertical planes-true's hope ofsections.

MODULEIV

Developmentofsurfaceofcubes,prisms,cylinders,pyramidsandcones
Intersectionofsurfaces-methodsofdeterminingliesofintersection-intersectionofprisminprismand cylinder.

MODULEV

Introductiontosometricprojection-isometricscales, isometricviews-isometricprojectionsofprisms, pyramids,cylinders,conesandspheres.
Introductionto perspectiveprojections: visualray methodandvanishingpoint method-Perspectiveofcircles-perspectiveviewsofprismsand pyramids.

REFERENCES

1. EngineeringGraphicP.I.Varghese&K.C. John, JET Publishers
2. Elementaryengineeringdrawing N.D.Bhatt,Charterpublishinghouse
3. Geometricdrawing, P.S.Gill,B.DKatarina&sonsLudhiana
4. EngineeringGraphics PIVarghese,VIPPublishers.

105 BASICCIVIL&MECHANICALENGINEERING

(A) CIVILENGINEERING

MODULE I

Materials:Cement-varietiesandgradeofcementanditsuses. Steel-typesofsteel forreinforcemembers,steelstructuralsections. Brick-varietiesandstrength,testson bricks. Aggregates-types&requirementsofgoodaggregates.Concrete-gradesofconcreteas per IScode, watercement ratio,workability,mixing,batching,placing,compactionandcuring.
Construction: Foundation-typesoffoundations-isolatedfooting, combined footing, raft, pile& Well foundations,

MODULE II

Superstructure :Brick masonry, English bond and Flemishbond,Stone masonry, Randomrubble masonry.Roofing-Steeltrusses,roofingforindustrialbuildings
Surveying: Principles,instruments, rangingandchainingofsurveylines,errors in chaining,fieldwork, fieldbook,selectionofsurveystations,reconnaissance,,

Leveling: Leveling instrumpets, different types, temporary adjustments, mean sea level, reduced level of point,bookingoffidle notes, and reduction of levels by height of collimation method.

REFERENCES

1. Engineeringmaterials :Renewal
2. Buildingconstruction : Penman
3. Atextbookofbuildingconstruction :N.K.R.Murthy
4. FundamentalsofcivilEngineering- : Roy Thomas-EducationalPublications:: :
5. Atextbookofbuildingconstruction :Jha&sigh
6. Surveying&Leveling : TP Kantar
7. Surveying&Leveling : Husain

Typeof Questionsfor UniversityExam.

Q1.Fourshortanswerquestionsof5markswithtwoquestionsfromeachofthetwomodules.

Q2.toQ.3:TwoquestionsA&Bof15marksfromeachmoduleswithoptiontoanswereitherA&B.

(B)MECHANICALENGINEERING

MODULE III

Thermodynamics: thermodynamicsystems-open,closedandisolatedsystems, equilibrium state. Of a system, property' and state, process, cycle, work, Zeroslaw of thermodynamics-conceptoftemperature, temperatrue scales.Firstlaw-internalenergy, enthalpy. Secondlaw-Kelvin-Plankand Clausesstatements, CarnotCycle.

RefrigerationandAir conditioning:Vaporcompressionandvaporabsorptionrefrigeration systems, summerandwinterAirconditioning,Comfort andindustrialAirconditioning.

Elementary ideasofsimplereactionandimpulseturbines, compoundingofturbines.

MODULE IV

InternalCombustionEngines: working oftwostrokeandfourstrokePetrolandDiesel engines, simple Carburetor, ignition system, fuelpump, fuel injector, cooling system, lubricating system.TransmissionofPower:Belt drives (openandclosed), chaindrives.

Metalfabrication: Welding-Arc, gas, resistancewelding, Weldingeffects, Soldering, Brazing

Text Books &References:

1.EngineeringThermodynamics P.K.Nag

2.EngineeringThermodynamics D.B. Spalding&E.H.Cole

3.EngineeringThermodynamics VanWaylon

5.Thermodynamics J.P.Holman

6.ElementsofInternalCombustionEngines Godowsky,TataMcGrawHillGill, Smith&Ziurys,

7. Fundamentals of InternalCombustionEngines

8. RefrigerationandAirConditioning,

Type of Questionsfor University Exam.

Q1.Fourshortanswerquestionsof5markswithtwoquestionsfromeachofthetwomodules.

Q2.toQ.3:TwoquestionsA&Bof15marksfromeachmoduleswithoptiontoanswereitherA&B.

107 BASICELECTRICALENGINEERING&ELECTRONICS

(A)ELECTRICALENGINEERING

ModuleI

Basic principles ofElectric circuits: Review ofOhms law -Definition of Resistance,current,voltageandpower-Seriesandparallelcircuits-constantvoltagesourceand constantcurrentsource.

Network Theorems: Kirchhoff'slaws- Network analysis by Maxwell's circulation currents Thevenin's theorem-Superpositiontheorem-Norton'stheorem-Simpleillustrativeproblemson networktheorems.

Reviewof electrostatics- Coulomb's Law- Electricfield strength and Electric flux densitycapacitance.

Module II

Reviewofelectromagneticinduction-Faraday's Law-Lenz's Law-mutually inducedemu. Magnetic circuits -magnetic field of acoil -Ampere turns calculation –magnetic flux-fluxdensity-fieldstrength.

Measuringin Struements: Workingprincipleofgalvanometer, Ammeter, Voltmeter, wattmeter& Energymeter.

AC fundamentals: Generation of alternating voltage and current - equations of sinusoidal voltageandcurrent- waveform,cyclefrequency,timeperiod,amplitude,phasedifference,rms value, average value, power factor &form factor. Vector diagram -addition andsubtraction ofvectors-sinewaves in phaseandoutofphase. A C circuit: RC, RL, RLCcircuits-series and parallel - current, voltage and power relationships. Poly phase circuits: vectorrepresentationphasesquence-staranddeltaconnections.

(B)ELECTRONICSENGINEERING

Module III

Passive components: Resistor-Capacitor-Inductor -Color coding. Transformer-different types, construction.

Semiconductors: Energybanddiagram- intrinsic& extrinsicsemiconductors,doping- PN junction-Diodes, Zenerdiodes-Characteristics-Applicationofdiodes.Rectifiers-Halfwave, fullwave andBridgerectifiers-Ripplefactorandregulation.

Transistors: - PNP and NPN transistors - theory of operation - Transistor configurations Characteristics- comparison.

Special semiconductordevices-PET- SCR-LED-LCD-V-Icharacteristics,applications. Module IV Fundamentalsofin strumentation:Transducers-Definition-Classification-Active&passive-Transducerforposition,pressure,velocity,vibrationandtemperature measurements.

CRO-principleofoperation- measurementof amplitude, frequencyandphase.

Fundamentals of Communication: Analog communication- concept of modulation, demodulation. Types: AM -FM -PM- Block diagram of general communication system - Basic conceptsofdigitalcommunication-Blockdiagram.

TextBooks

1.BasicElectronics-SolidState-B.L.Theraja,S.Chand&Co.
2.FundamentalsofElectrical Engineering-LeonardS.Bobrow,OxfordUniversityPress.

FurtherReferences:

1.ElectricalTechnology:EdwardHughes,AddisonWesleyPublication
2.ElectronicDevices&Circuits: G.K.Methyl &RaviMethyl,KhnnaPublishers

Typeof Questionsfor UniversityExam.

Q1.Eightshortanswerquestionsof5markswithtwoquestionsfromeachofthefourmodules.
Q2.toQ.5:TwoquestionsA&Bof15marksfromeachmoduleswithoptionto answereitherA&B.

108COMPUTERPROGRAMMING

ModuleI

Introductionto programming in C: Fundamental data types- integer, floating point, and enumerateddatatypes,Expressions-arithmetic,relationalandlogicoperators,Type conversion- simple and compound statement, Access to standard library, standard I/O-getchar,putchar,FormattedI/O,scanf,printf,errorhandling,lineinputandoutput,control structures, selection statement, IF, SWITCH, WHILE, DO WHILE, FOR, BREAK, COINTINUE,GOTO,RETURNstatements.

ModuleII

Functions:Declarationsandfunctions, parameterpassing mechanism,storageclasses-scope, visibility,and life timeofvariables, AUTO,EXTERN,STATIC andREGISTERmodifiers, Recursion.

ModuleIII

Arrays:Singleandmultidimensionalarrays,sorting,selectionsort,search-linearsearchand binarysearch,Structuresandunion.

ModuleIV

Pointers:Pointers and addresses,pointerarraysfunction returningpointers, pointersto function, pointerarithmetic,pointerstostructures,array ofstructures,preprocessordirective,command line arguments,typed.

TextBook&References:

1. ComputerFundamentals&ProgramminginC: Pradeep Dey &ManasGhosh(OXFORD)
2. Computer Fundamentals : Dr.VarghesePaul(EPD)
3.ProgramminginC : B.S.Gottfried (Schaumseries,TMH)

TypeofQuestionsforUniversityExam.

Q1. Eightshortanswerquestionsof5markswithtwoquestionsfromeachofthefourmodules.
Q2.toQ.5:TwoquestionsA&Bof15marksfromeachmoduleswithoptiontoanswereitherA&

109TECHNICALCOMMUNICATIONANDSOCIALSCIENCES

(ModuleIVEnvironmentalStudies: 1hourperweek
Othermodules: 2hourperweek)

PART-ATECHNICALCOMMUNICATION

ModuleI (25hours)

Oral Communication: starting and ending aconversation; telling and asking people todo things; expressing opinionsand ideas, decisions and intentions, offersand invitations, feelings,rightandwrong,numbersandmoney.
Purposeandaudience;dealingwithcustomersandclients;face-to-facediscussions;meetingsand attendingmeetings;checkingunderstanding;raisingquestions;givingandreceivingfeedback; usingbodylanguage;leadinganddirectingdiscussions;concludingdiscussions;usinggraphicsinoralpre sentations

Reading Comprehensionand referenceskills: skimming andscanning; factualand inferential comprehension;prediction;guessingmeaningof wordsfromcontext;wordreference; comprehendinggraphicsintechnical writing.
Reading strategies;reading speed; reading between the lines forhiddenmeaning; interpreting graphics; using adictionary ;using an index; using acontentslist to find information; choosingtheright referencesource.

ModuleII (20hours)
WrittenCommunication:note makingand notetaking;summarizing;notesand memos; developing notesintotext;organizationof ideas:cohesionandcoherence;paragraphwriting: ordering information inspace andtime;shonesays:descriptionandargument; comparisonand contrast;illustration;usinggraphicsinwriting:tables andcharts;
Diagramsandflow-charts;maps,plansandgraphs.
Spellingrulesandtips;writingaroughdraft;editingandproofreading;writingthefinaldraft; stylingtext;fillingincomplexforms;standardletters;CV;writingarepon;writingleafletsand brochures;writingreferences;essaywriting:
Expositorywriting; description of processes and products; classification; the instructional Process; argumentsandpresentationofarguments; narrating ventschronologically.

PART-BSOCIALSCIENCES

ModuleIII (15hours)
Science,TechnologyandEthics
Impactofscienceandtechnologyonthedevelopmentofmodem civilization.Thephilosophyof modemsciencescientificdeterminism-uncertaintyprinciple.Relevanceof scientific temper. Scienceandreligion.Scienceandtechnologyindevelopingnations.Technologicaladvancesof modem India.Intermediateandappropriatetechnology.
Development totechnicaleducationinIndia.

SensesofEngineeringEthics-Varietyofmoralissues-Typesofinquiry-Moraldilemmas-
MoralautonomyKohlberg'stheor-Gilligan'stheory-ConsensusandControversy-

Professional ideal sand vinues-Attributesofanethicalpersonality-Theoriesaboutrightaction
-Selfinterest.
Responsibilities and Right so engineers-Collegiality and Loyalty- Respect for authority-
CollectivebargainingConfidentiality-Conflictsofinterest-Professionalrights.

ModuleIV

EnvironmentalStudies:(30hours)

Naturalresources- issuesrelatedtotheuseandoverexploitationofforestresources,water resources,mineralresources,foodresourcesandenergy resources- roleofanindividualin conservationofnaturalresources-equitableuseofresourcesforsustainable life styles.

Conceptofanecosystem –structureand function-energyflow intheecosystem- ecological succession-foodchains,foodwebsandecologicalpyramids-structureandfunctionsoforest ecosystemandanaquaticecosystem.

Definitionofbiodiversity -genetic,speciesandecosystem diversity-biogeographicallyclassificationofIndia - Valueofbiodiversityonsumptiveuse,product inverse,social, ethical,aestheticandoptionvalues.

Causes,effectsandcontrolmeasuresof airpollution,waterpollution,soilpollution,noise pollution, marine pollution, thermal pollution and nuclear hazards - Causes, effects and controlmeasuresuburbanandindustrialsolidwastes-Roleofanindividual inpreventionof pollution-AnoverviewofthevariousenvironmentallegislationsinIndia-Issuesinvolvedinenforcementofenvironmentallegislation.

Theconceptofsustainabledevelopment-Urbanproblems related toenergy-Water conservation, rain water harvesting, water shed management -Resettlement and rehabilitation ofpeople; its problems and concerns -Climate change, global warming, acid rain, ozone layerdepletion,nuclearaccidentsandholocaust-Populationgrowthandproblemsof populationexplosion-Environmentalethics:issuesandpossiblesolutions..

TextBooks:

MeenakshiRaman andSangeeta Shanna:TechnicalCommunication: Principlesand Pratics OxfordUniversityPress,2004

Rajagoalie.R: EnvironmentalStudies:FromCrisis to Cure,Oxford UniversityPress,2005

JayashreeSuresh and B.S. Raghavan : ProfessionalEthics,S.Chan&Company Ltd, 2005. History of Science, Cambridge UniversityPress.

WCDampier

AdrianDoff &ChristopherJones, : References: LanguageinUseUpperintermediate,self-study workbook&classroombook,Cambridge UniversityPress2000

KrishnaMohan&MeenakshiRaman, : Effective English Communication, Tata Mc-GrawHiII,2000.

EdmundD.Seebaur&RobertL.Barry : Fundamentals of Ethics for Scientists and Engineers,OxfordUniversityPress,2001

KrishnaMohan&MeeraBanerji, : Developing Communication Skills MacMillan IndiaLtd,2000.

RajendraPal&JSKoriahaIli Essentialsofbusinesscommunication,S.Chand &CompanyLtd
SarahF'reeman, StudyStrategies,OrientLongman,1978.
Meenambal T,UmaRMandKMuraU Principles of Environmental Science and Engineering,S.Chand&CompanyLtd,2005

UniversityExamination pattern

The question paper will have two parts.

Part A(TechnicalCommunication)will cover Modules I,IIandwillhaveaweightage of50marks.

PartB(SocialSciences) willcover ModuleIIIandModuleIV(EnvironmentalStudies)andwillhaveaweightagof50marks.Part AandPartBwillhavetobeansweredinseparate answerbooks.

PartA

Universityexaminationpattern

Q1-4shorttypequestionsof5marks,2eachfrommoduleIand II

QII-2questionsAandBof15marksfrommoduleIwithchoicetoansweranyoneQIII-2 questionsAandBof15marksfrommoduleIIwithchoice,toansweranyone

PartB

Universityexaminationpattern

QI-5shorttypequestionsof4marks,2from module IIIand3frommoduleIV

QII-2questionsAandBof10marksfrom moduleIIIwithchoicetoansweranyone

QIII-2questionsAandBof20marksfrom moduleIV withchoicetoansweranyone.

110 COMPUTERPROGRAMMINGLABORATORY

1. Studyofascommands.Generalintroductiontoapplicationpackages
2. Programmingusingcontrolstructures&pointers.
3. Searching&sorting
4. Creationanduseofdatabasesinusoid tabledatabasepackage
5. ProgrammingexercisesinC.

Note:50%marks isearmarked forcontinuous evaluation, and 50%marks forendsemesterexamination tobe assessedbytwoexaminers.Acandidateshallsecureaminimumof 50% marksseparatelyforthetwocomponentstobelegibleforapassinthatsubject.

111 ELECTRICALANDMECHANICAL WORKSHOPS

ELECTRICALWORKSHOP

1.Onelampcontrolledbyoneswitch
2.Seriesandparallelconnectionsoflamps.
3.Staircasewiring.
4.HospitalWiring.
5.Godownwiring.
6.Fluorescent lamp.
7.Connectionofplugsocket.
8.Differentkindsojoints.
9.Transformerwinding.
10.Soled ringpractice.
11.Familiarization ofCRO.

MECHANICALWORKSHOP

1)FittingShop.
2SheetMetalShop
3)FoundryShop
4)WeldingShop
5)CarpentryShop(Preliminaryexercisesforbeginnersinallshops.Specificmodelsmaybe designedbytheteachers.)

Introductiontotheuseofconcretemix.

Note:50%marks is earmarkedforcontinuous evaluation, and 50%marks forendsemesterreexaminationtobe assessedbytwoexaminers.Acandidateshallsecureaminimumof50 %marksseparatelyforthetwocomponentsto beelegibleforapassinthatsubject.

301ENGINEERING MATHEMATICS1I

MODULE 1

MatricesandVectorspaces:Rankofmatrix,Echelonandnormalform, Solutions oflinear systems of algebraic equations, Eigen values and Eigen vectors, Clayey Hamiltontheorem (nonproof). VectorSpaces-Subspaces,-LinearIndependenceofvectors-Linearspan-DimensionandBasis. Linear transformations.

MODULEII

Fourier series and Fourier integrals: Fortierseries of Periodic functions- Euler formulae for Fouriercoefficients-functionVKDYLQJSHULRGDUELWUDU\SHULRG-evenandoddfunctions-half range expansions, Fourier integral, Fourier cosine and sine transformations, linearity property,transformofderivatives,convolutiontheOrem(noproof)

MODULEIII

Laplace transforms: Linearity property, transforms of elementary functions, Laplace transforms of derivativesand integrals, differentiation andintegration of transforms, convolutiontheorem (noproof)useofLaplacetransformsinthesolutionof initialvalue problems, unitstepfunction, impulsefunction-transformofstepfunctions, transforms ofPeriodicfunctions.

MODULEIV

Vector calculus: Scalar and Vector point functions-Gradient and directional derivative of a scalar point function- Divergence andCurl of a vector point functions-their physical meanings. Evaluation of line integral, surface integral andvolume integrals, Gauss's divergence theorem, Stoker'stheorem (No Proof of these theorem), conservative force fields, scalar potential.

TEXTBOOKS REFERENCE

Advanced engineering mathematics:R.K.Jain, S.R.K.Iyengar,Narosa Publishers.
Advancedengineeringmathematics:C.R.Wilie&L.C.Barrett,Mgh
Mathematicaltechniquesforengineers: Larry C And rews, Ronald CPhilips, Phi &scientists Publishers
Advanced engineering mathematics: M.C.Potter, J.L.Goldberg Oxford Unversity Press
Higherengineeringmathematics:B.S.Grewal,KhannaPublishers

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswer questionsof5 markseachwithtwoquestionsfromeachofthefourmodules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswereitherAor B.

302CHEMICALENGINEERINGI

ModuleI

Materialbalance

Introduction to chemical engineering, basic chemical calculations-mole concept, methods of expressingcomposition-molefraction,weightfraction,volumefraction,concentrationofliquid solutions-morality,modality ,normality,ppm.Ideal gasesandgasmixtures-ideal gas law,Amiga'slaw,Dalton' slaw, Henry'slaw,averagemolecularweight,densityofgases,partialpressureand partialvolumecalculations. Materialbalance in evolving chemical reactions and not in volving chemical reactions, simple calculations involvingcycle,by passesandpurgesteams.

ModuleIIEnerg

ybalance

Energybalance-heatcapacity,specificheatandenthalpy,heat capacityofgasesatconstantpressure,heat Capacityofgaseousmixtures,latentheats,enthalpychangesaccompanyingchemicalreactionsstandardheatof formationandstandardheatofcombustion,standardheatofreaction.

ModuleIII

ChemicalEngineeringThermodynamics

Chemicalthermodynamics,fundamentalconceptsanddefinitions-typesofthermodynamicsystemsand properties-closed,openandisolatedsystem-intensiveandextensiveproperties-pathandstatefunctions,first lawofthermodynamics,secondlawofthermodynamics,entropy,changeinentropy,Maxwellrelations,heat capacityintermsfentropy,equationofstate ofgases,the principleofcorrespondingstates,compression andexpansionofflids-JouleThomas onexpansion. Gibbsfreeenergychange,equilibrium constant,effect oftemperatureoneequilibrium constant.

ModuleIV

Mechanicaloperations

Solids: Propertiesofsolids,methodsofsizeanalysis-differentialandcumulative,screening, screeningequipment,effectivenessofscreens.Sizereductionofsolids,typesofequipment-jaw crushers,gyratorycrushers,hammermills,ballmill,powerrequirement,lawsofcrushing. Handling ofsolids-principleofoperationofbeltconveyers,bucketelevatorsand pneumaticconveyers.

Fluids:Flowofsolidsthroughfluids-maximumsettlingvelocity.Sedimentation-Laboratorybatch sedimentation,calculationofareanddepthforcontinuousthickeners.Principleofcentrifugal separation.

Filtration:equipmentsforfiltration-plateandframefilterpress,rotarydrumfilter,constant pressureandconstant rat filtration,filtermedia,filteraids.

Text books:References:

1. W.L. McCabe, J.C. Smith &Peter Harriott, Unit Operations of Chemical Engineering, McGraw-Hill
2. K.V.Narayanan,Stoichiometryand Process Calculations, Prentice-HallofIndiaPvt.Ltd.
1. W.L.Badger &J.T.Banchero,IntroductiontoChemicalEngineering,TataMcGraw-Hill
2. K.V.Narayanan,A Text Book of ChemicalEngineering Thermodynamics,PrenticeHallIndiaPvtLtd.
3. ChristeJ.Geankoplis, TransportProcessandUnitOperations, PrenticeHall India PvtLtd.

Type ofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5 markseachwithtwoquestionsfromeachofthefourmodules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswereitherAor B.

303FLUIDMECHANICSANDFLUIDFLOWMACHINES

ModuleI

Scopeoffluidmechanics- Dimensionsandunits-Definitionoffluid- Fluidproperties-density, specificweight,pressure,viscosity,surfacetensionandcapillarity,compressibility-Rheologic Classification.

Fluid Statics - Pressure at a point - Basic equation of fluid statics - Hydrostatic equations for incompressibleandcompressiblefluids-Hydrostaticforceonasubmergedplaneandcurvedsurfaces-Buoyancyandequilibriumofflootingbodies-Absoluteand gaugepressure-Pressure measurementbymanometersandpressuregauges.

ModuleII

FluidKinematicsandFluidDynamics-continuumLagrange anandEuleranapproaches - Classificationof fluid motions- pathline,stream line, streak line, stream tube,one,twoandthree dimensional flow, velocity field - acceleration of fluid particle in a velocity field-Continuity equation(oneandthreedimensionaldifferentialforms)-equationofstreamline-streamfunction-velocitypotentialfunction- circulation- flownet- fluiddynamics- equationsofmotion- Euler's equationalon gastreamline- Bernoulli'sequation- applications- venture meter,orifice meter,pitontube.

Dimensionalanalysis-Buckingham'sPitheorem-applications-similaritylawsandmodels.

ModuleIII

IncompressibleFluidFlow-Viscousflow-Navies-Stoke'equation(statementonly)-Shear stress, pressuregradientrelationship – laminarflowbetweenparallelplates-Laminarflowthroughcircular tubes(HagenPoiseulle's)-Hydraulicandenergygradient-flowthroughpipes-Darcyweisbachequation-piperoughness-frictionfactor-Moody'sdiagram-minorlosses-flowthroughpipes inseries andin parallel-powertransmission.

Boundarylayerflows,boundarylayerthickness,boundarylayerseparation –dragandliftcoefficients.

ModuleIV

Fluidmachines:definitionandclassification-exchangeofenergy- Euler'sequationforturbo machines-headandspecificwork-componentsofenergytransfer-degreeofreaction.

Hydroturbines:definitionandclassification-Francisturbine-Kaplanturbine- workingprinciple –workdone-specificspeed-efficiency-performancecurveforturbines.

Pumps:definitionand classification- Centrifugalpump : workingprinciple,velocitytriangles, specificspeed,efficiencyandperformancecurves-Reciprocatingpumps:workingprinciple, Indicatordiagram andperformancecurves-cavitations inpumps-Rotarypumps:workingprincipleofgear andvanepumps.

TextBooks References

1. Kumar,K.L.EngineeringFluid Mechanics, EurasiaPublishingHouse(P)Ltd,NewDelhi (7the edition)1995.
2. VasandaniV.P.HydraulicMachines-TheorandDesign, KhannaPublishers 1992
1.StreeterV.L.andWylieE.B. FluidMechanicsMcGraw Hill1983.
2. EdwardJ.ShaughnessyJr.IraM.KatzandJamesP.Schaffer.IntroductiontoFluid MechanicsOxfordUniversityPress2005.
3.Jagdish LalHydraulicMachinesMetropolitanBookCoDelhi
4.SomandBiswasIntroductiontoFluidMechanicsandMachineryTataMcGraw Hill

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswer questionsof5 markseachwithtwoquestionsfromeachofthefourmodules.

Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswereitherAor B.

304MANUFACTURINGPROCESSES

ModuleI

EngineeringMaterials:-ClassificationProperties-mechanicalthermalchemicalandtechnological. IronandSteel-ProcessesandClassifications.Non-ferrousmetals, processes, propertiesand use.Heat treatment ofsteels- purpose andmethods.Processes-annealing, normalising,hardening,tempering.

ModuleII

Welding :-Introduction, weldabilityTypes of welding, Gaswelding, Arcwelding - submergedarc, TIG, MIG.Resistancewelding,Solidstatewelding,Electronbeamwelding,Laserbeamwelding.Oxygencutting.Heataffectedzones,Welddefects,Inspectionofweldedjoints.

ModuleIII

Metal Casting:- Pattern- pattern materials, types of patterns, pattern allowance, Moulding sands-propertiesandclassification.CoreandcoresandMouldingprocess. Specialcasting methods-die casting, centrifugal casting, investment casting, slush casting. Casting defects andinspection.

ModuleIV

MetalForming:-Mechanicalworking ofmetals. Hotworking, cold working. Methodsand process ofrolling,forgingandextrusion.

Machining:- Metal cutting, Orthogonal and Oblique cutting, Cutting tool materials. Classificationofmachine tools- lathe, shaper,millingmachine, drillingmachineand Grindingmachine.Advancedmachiningmethods-ECM,EDM,USM,AJM.

TextBooks: Reference

1) S.KalpakjianandS.R.SchmidManufacturing Engineering and Technology,Pearson EducationAsia

2)P.C.Sharma,ATextBookofProductionTechnology,S.Chand&Co,NewDelhi.

1)WeldingHandbook-Vol.ItoV: AmericanWeldingSociety.

2)HeinLopperandRosenthal,PrinciplesofMetalCasting

3)Chapman, WorkshopTechnologyVol.I,II,III

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswer questionsof 5markseachwithtwoquestionsfromeachof thefourmodules.

Q2toQ5: TwoquestionsA&Bof 15marksfromeachmodulewithoptiontoanswer eitherAor B.

305ELEMENTSOFMACHINEDRAWING

ModuleI

Limits,fits&tolerances:IS919 code, cylindricalfits,tolerancesmoles,standardpreferredsizes and fitsholebaseddimensioning, zymologyforform,locationand runout, tilerankingforposition, concentricity,location,roundness,perpendicularityandrainout.

(2sheets).

ModuleII

Drawingsofjoints:Weldedjoints,types,weldingsymbols,drawingofweldedmachineparts withdetailsofwelding.

Brackets,blocks,baseplateandcrankshaft.

Pipejoints:Couplerjoints,nipplejoints,union,socketandspigot,integralflangedjoints and hydraulicjoints. (6sheets)

ModuleIII

Screwed fastenings :Screwthread forms,vee and square threads, conventionalrepresentationof threads,hexagonalheadedboltandnut,squareheadedbolt,nutlocking arrangements,various typesofmachinescrewsandsetscrews,foundationbolts,lockboltwithsquareplate,ray bolt andLewisfoundationbolt.(3sheets)

CotterandPinjoints:socketandspigotjoints, gab andcotterjointforce angular rods,sleeve andcotterjoints,knucklejoint.(3sheets)

Textbooks: References

1) N.D.Bhatt :MachineDrawing,CharterPublishingHouse,Anand
2) P.I.Varghese&K.C.John:MachineDrawing:
3) P.S.Gill : GeometricDrawing,Kataria&Sons,Ludhiana
4) Parkinson : FirstyearengineeringDrawing,Pitman,London
5) K.R.Hert : EngineeringDrawingwithproblemsandsolutions,ELBS

306 PRINCIPLESOFSAFETYMANAGEMENT

ModuleI

Introduction-Safety–Goalsofsafetyengineering.Needforsafety.Safetyandproductivity
Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents.Historyofsafetymovement.Theorgiesofaccidentcausation
Safetyorganization- objectives,types,functions,Roleofmanagement, supervisors,workmen,unions, governmentandvoluntaryagenciesinsafety.Safety policy.Safety Officer-responsibilities,authority.Safety committee-need,types,advantages

ModuleII

AccidentpreventionMethods-Engineering,EducationandEnforcement.
SafetyEducation&Training-Importance,Varioustrainingmethods,Effectivenessoftraining, Behaviororientedtraining.Communication-purpose,barriertocommunication.
Housekeeping:Responsibilityofmanagementandemployees.Advantagesofgoodhousekeeping.5sof housekeeping.
Work permits system-objectives, hot workand cold work permits.Typicalindustrialmodelsand methodology.Entryintoconfinedspaces.

ModuleIII

MonitoringSafetyPerformance:Frequencyrate,severityrate,incidence rate,activity rate.
CostofaccidentsComputationofCosts-UtilityofCostdata.Plantsafetyinspectiontypes, inspectionprocedure.Safetysamplingtechniques.Jobsafetyanalysis(JSA), Safety surveys, Safetyandits.SafetyInventoryTechnique.

ModuleIV

Accidentinvestigation-Why?When?Where?Who?&How?.Basics-Man-Environment&Systems.ProcessofInvestigation-Tools-DataCollection-Handlingwitnesses-Case study.
Accidentanalysis-AnalyticalTechniques-SystemSafety-ChangeAnalysis-MORT-MultiEvents Sequencing-TOR.

TextBooks: Reference:

1)N.V.Krishnan,SafetyManagementinIndustry, Jaico PublishingHouse,1997
2)RonaldP.Blake,IndustrialSafety:, PrenticeHall,NewDelhi,1973
3)DavidL.GoetschOccupationalSafetyandhealthPrenticeHall
4)TedS.Ferry,ModernAccidentInvestigationandAnalysis,JohnWiley&Sons.

1)WillieHammer,OccupationalSafety ManagementandEngineering,PrenticeHall
2)AlanWaring,SafetyManagementSystem,Chapman&Hall
3)JohnV.Grimaldi andRollinH.SimondsSafety Management, AllIndiaTravelerBookSeller, Delhi.
4)AccidentPreventionManualforIndustrialOperations:NationalSafetyCouncil,Chicago

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswer questionsof5 markseachwithtwoquestionsfromeachofthefourmodules.
Q2toQ5 : TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswereitherAor B.

307MACHINESHOP

Introduction toLathe: Spindle drive -work holding devices -types ofLathe tools -tool holders-toolmovement-selectionofspeeds.Feedanddepthofcut-useof cuttingcoolants
-Principle ofthreadcutting -V-thread and Squarethread -thread standards-cuttingtool Types –grindingof tools-selection of cuttingspeeds.Exercises:Exercisesinvolving cylindrical turning, Taper, Turning,Facing, Shoulder turning and curve turning -thread cutting.

Introduction to machinetools like horizontal milling machines, vertical milling machines, slottingandshapingmachines,workholdingdevices-spindledrives-millingcutters-gearmilling-surface slot milling-indexing head-simple and differential indexing-grindingwheel-specificationandselection-drillingandreaming-capstanandturretlathes-ideasof tool layout.
Exercise :Exercisesonlathe-curveturning ,multistarthread,drilling andboring,internal thread.
Exerciseson milling machines - surface milling and slot and keyway milling, straddle milling,machiningofspurandhelicalgears.

Exercise son-Shaperandslotting-machiningofplaneandbevelsurfaces-keywayandslot machining,exercisesondrillingandreaming,surfacegrindingandtoolgrinding.

References:
1) Productiontechnology :HMT
2) ToolEngineer'shandbook : ASTME
3) Burghardt,AxlleredandAnderson,Machinetooloperations1&2
4) B.L. Boguslavsky, Automatic andsemiautomaticlathes,Peasepublications.
5) Fundamentalsoft tooldesign : ASTME

Note: 50%marksisearmarkedforcontinuousevaluation,and50%marksforendsemester examinationtobeassessed bytwoexaminers. Acandidate shall secure a minimumof 50%marksseparatelyforthetwocomponentstobeelegible forapassinthatsubject.

308FLUIDMECHANICS ANDMACHINERYLAB

Study ofpipefittingsand studyofdevices usedformmeasurement ofpressure,velocity,rateofflow, Metacentricheightandradiusofgyrationoffloatingbodies.
ExperimentalverificationofBernoulli'stheorem.

Steadyflow through pipes -determination of friction factor and Reynolds'snumber.

Determinationofthelosscoefficientsforpipefittings.

Hydrauliccoefficientsof mouthpieces,nozzlesandorifices.

Calibration ofVenturameters, orificemeters,nozzleandbendmeters. Force

duetoimpactofjetsonvanes.

Performance characteristics of centrifugal pumps at constant speed.

ConstantheadcharacteristicsofFrancisturbine.

Performanceofhydraulicram.

Note:50%marksisearmarkedforcontinuousevaluation,and50% marksforendsemester examinationtobeassessedbytwoexaminers.A candidate shall secureminimum of 50%marks separatelyforthetwocomponentstobeelegible forapass inthatsubject.

401ENGINEERING MATHEMATICS1II MODULE1

ComplexAnalyticfunctionsandconformalmapping:curvesandregionsin thecomplex plane, complexfunctions,limit,and derivative,analyticfunction,Cauchy- Riemannequations,Elementary complexfunctionssuch as powers,exponentialfunction,logarithmic, trigonometricand hyperbolicfunctions.

Conformalmapping:Linearfactionaltransformations,mappingbyelementaryfunctionlikeZ^2,e^z, sin z,cosz,sinz,andCos hz,Z+1/Z

ModuleII

Complex integration:Lineintegral,Cauchy'sintegraltheorem,Cauchy'sintegral formula, Taylor's series, Laurent's series, residue theorem, evaluation of real integrals using integration around unit circle, around the semi circle, integrating contourshaving poles, on thereAlexis.

ModuleIII

Partialdifferentialequations:

Formulationofpartialdifferentialequations.

SolutionsofequationsoftheformF(p,q)=0,F(x,p,q)=0,F(y,p,q)=0,F(z,p,q)=0F1(x,p)= F2 (y,q),Lagrange'sformPp+Qq=R

Linearhomogeneouspartialdifferentialequationswithconstantco-efficient

ModuleIV

Vibratingstring:onedimensionalwaveequation,D'Alembert'ssolution,solutionbythemethod ofseparationofvariables.

One dimensional heat equation, solution of the equation by the method of separation of variables, SolutionsofLaplace'sequationoverare ctangularregionandacicularregionbythemethodof separationofvariables.

TEXTBOOKS

Advanced engineering mathematics: R.K.Jain, S.R.K.Iyengar,Narosa Publishers.

Advancedengineeringmathematics:C.R.Wilie&L.C.Barrett,Mgh

REFERENCES

AdvancedEngineeringMathematicsErwinKreyszig,WilseyEastern

ComplexVariables&ApplicationsChurchill R.V..MghPublishers.

Advanced engineering mathematics M.C.Potter, J.L.Goldberg Oxford University Press

Higherengineeringmathematics:B.S.Grewal,KhannaPublihser

Type of Questions for University Examination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5 : TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

402CHEMICALENGINEERINGII

ModuleI

Heattransfer

Heat transfer byconduction, steadystateconduction,Fourier'slaw,heattransfercoefficient,heat exchangers-shell and tube heat exchangerand double pipe heat exchanger,LMTD, individualheat transfer coefficient, overall heat transfer coefficient, heat transfer by convection-natural convection, forcedconvectioninlaminarandturbulentflow(elementaryideas).Radiationheattransfer-lawsof radiation.Evaporators –heattransferinevaporators,singleeffectevaporatorcalculations, typesof evaporators

ModuleII

Masstransfer

Principles of mass transfer, Fick's law of molecular diffusion, diffusion in solids and liquids. Distillation – relative volatility,simpledistillation,steamdistillation,distillationwithreflux,principleof isotropicandextractiveinstillationMcCabeThielemethodofcalculationofnumberoftheoretical stages,total,minimumandoptimumflux.

Absorption,equilibriumsolubilityofgasesinliquids,plateandpackedcolumns,packingmaterials.

ModuleIIIMa

sstransfer

Introductiontodrying-equilibriummoistureandfree moisture,criticalmoisturecontent,boundandunbound water, rateofdryingcurves, dryingequipments-traydryers, tower dryers, rotarydryers,fluid-beddryers,spraydryers.

Principle of liquid-liquid extraction, liquid-liquid equilibrium, equipment for liquid extraction - mixer Settlers,spraytowers, Bollmannextractor.Solid-liquidextraction-simpleleaching,major equipmentsforsolid-liquidextraction

ModuleIV

Chemicalreactionengineering

Classification ofreactions,variablesaffectingrateofreaction,definitionofreaction rate.Kineticsof homogeneousreactions-concentration pendent termofarateequation,temperatruedependenttermofa rate quation,theoriesofreaction-collisiontheory,transitiontheory,Arrheniusequation.Interpretationof ratedatainconstantvolumebatchreactors. Ideal reactors-theconceptofideality,designexpressionsfor batch,tubularandstirredtankreactors.Elementaryideasaffron-idealreactorperformance,residencetime distribution.

Text books

1. W.L. McCabe, J.C. Smith &Peter Harriott, Unit Operations of Chemical Engineering, McGraw-HillBookCo,
2. O. Levenspiel,Chemical Reaction Engineering, John Wiley &Sons,

Referencebooks

1. W.L.Badger&J.T.Banchero,IntroductiontoChemicalEngineering,TataMcGraw-Hill
2. RobertE.Treybal,MassTransferOperations,McGrawHill
3. ChristeJ.Geankoplis,TransportProcessand UnitOperations,PrenticeHallIndiaPvtLtd.
4. LannyD.Schmidt,TheEngineeringofChemicalReactions,OxfordUniversityPress, 2005.

Type of QuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeach thefour modules.

Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswereither Aor B.

403STRENGTHOFMATERIALS

MODULEI:
SimpleStressandStrainandPrincipalStresses
Axialandshearstressesandstrains-elasticity,Hook'slaw-Factorofsafety,Steppedbars, Barsofuniformlyvaryingcross-sections-LateralStrain-Poisson'sratio-Volumetric strain-elasticconstantsandtheirrigationships- stressesincompositebarsduetoaxialloadingand temperature.Strainenergyduetoaxialload-stressesduetoimpactandsuddenlyapplied loads.

Stateofstressatapoint-Normalandtangentialstressesonagivenplane-Principalstressesandtheirplanes, planeofmaximumshear-Mohr'scircleofstresses.

MODULE II:
ShearForceandBendingMoment
Relationshipconnectingintensityofloading,shearingforceandbendingmoment;Shearforceandbending momentdiagramsforcantilever,simplysupportedandoverhangingbeamssubjectedtoconcentratedload andUDL-maximum bendsmomentandpointtocontraflexure.
Theoryofsimplebending-assumptionsandlimitations-Derivationofbendingformulaandits applicationstoengineeringproblems

MODULEIII:
DeflectionofBeamsandThinandthickwalledstructures
Differential equationoftheelacticcurve.Slopeanddeflectionofbeamsbymethodofsuccessive integration,McCausley'smethod.

Hoopandlongitudinalstressesinthe walledcylindricalandsphericalshellssubjectedtointernal pressure-Changesindimensionandvolume;ThickCylinders-Lame quations, shrinkfit,compoundcylinders,wirewoundcylinders.

MODULE IV:
TorsionandColumns
Theoryoftorsionandassumptions-Torsionofsolidandhollowcircularshafts-Powertransmission,strength andstiffnessofshafts.Closeandopencoiledhelicalsprings.
Theoryofcolumns-bucklingandstability,bucklingoflongcolumns,Euler'sFormula,Longcolumnswith differentsupportconditions.

Textbook:

1. Gere,M.J."MechanicsofMaterials",ThomsonLearning.
2. Subramanian,R."StrengthofMaterials",OxfordUniversityPress,2005.

References:

1. Popov,E.P.,"AnalysisofStructures,"KhairnaPublishers,1985.
2. Vazirani,V.NandRatwani,MM," MechanicsofMaterials",PrenticeHall,1982.
3. Ramamurtham,S.,"StrengthofMaterials",DhanpatRai&Sons,1974.

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

404FIREENGINEERING-I

MODULE-I

Introduction- temperature, heat, specific heat, flash point, fire point, ignition, combustion; Ignition- pilot ignition, spontaneous ignition, ignition sources; Types of combustion-rapid, spontaneous, explosion;Productofcombustion-flame, heat,smoke,firegases Development tofire-incipient, smoldering,flameandheatstages;Diffusionflames-zones ofcombustion, shouldering combustion, characteristics of diffusion flame; Premixed flames-burning velocity, limits of flammability, explosion and expansion ratios, deflagration and detonation, characteristics of premixed flame; Explosion-physicalexplosion,chemicalexplosion;Special kinds of combustion-Flash fire, Pool fire, Deepseatedfire, Spoillver,Boilover,Slopover,Dustexplosion,BLEVE,UVCE;Classificationof fire basedonmaterial.

MODULE-II

Spread of flames in solids and liquids, linear and three dimensional fire propagation; Smoke - constituentsofsmoke,quantityandrateofproductionofsmoke,qualityofsmoke,smokedensity,visibility insmoke,principlesofspreadingquantityofsmoke,smokemovement;Pressurizationmodelingof smokemovement; Toxicity ofsmoke- effectofharmfulagentspreventing escapeandcausinginjuryor death-CO,CO_2,Nitrogenoxide,Shulphardioxide.

MODULEIII

Use and maintenanceof fire Service Equipments-Hydrantsand stand pipes, Hose reels-hose fittings- coupling, Branches, Branch holders, Radial branches, Monitors, Nozzles, Collecting heads, suction, hose fittings, adopters and ramps. Introduction to fire fighting vehicles and appliances:- Pumps, primers. Crash tenders, rescue tenders, hydraulic platforms, turntable ladders, hose laying tenders, controlvans,fireboats.Ladders-featuresoextension ladders,wheelsescape,hookladder,turn-table, Snorkel, safety devices, uses and maintenance. Small gear and miscellanea useequipments'-General purpose tools andequipment,Lampsandlighting sets. Ropes andLines-Types-wireandrope lines usedinfireservice.Useandtestingoflines,knots,Bendsandhitches,Generalropework.

MODULEIV

Fire hydraulics: Briefed planetstream,pressurelooser gainbecauseofelevation,static flowandhydraulicpressures, suction,drafting,frictionloss.Advantages ofmultiplelines.Discharge capacitiesof nozzleson hoselines. Nozzlereaction.Pressuredifferentialfire groundhydraulics:- method of determiningflow and direction loss; standard nozzle pressures;GPM method Application of GPM method for hand lines, multiple hose lines, master stream appliances, stand pipes and appliances, conversionof various hose sizes, small lines, unequal discharge pressure, back pressure, unequalhosediameters.

TextBooks

1. Ron Hirst, "UnderdownsPractical Fire Precautions", Gower PublishingCompanyLtd., England, 1989.
2. HMSO,"ManualofFiremanship 1to13",
3. JainV.K.,"FireSafetyinBuildings",NewAgeInternational(P)Ltd.,NewDelhi,1996
4. JamesFCassey,"Fireservicehydraulics",

ReferenceBooks

1. GuptaR.S."AHandBookofFireTechnology".
2. KevinCassidy,"FireSafety andlossPrevention".
3. NFPA,"FireProtectionHandBook".
4. NSC,"AccidentPreventionManualforIndustrialOperation"
5. PanchdhariA.C.,"ManagementofFire".

Typeof QuestionsforUniversityExamination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2toQ5: Two questions A & B of 15 marks from each module with option to answer either A or B.

40405ELECTRICALTECHNOLOGYAND SAFETYINELECTRICALSYSTEMS

ModuleI

Construction andPrincipleof operationof the cmachines-e.m.fequationof generator-useof interlopes-characteristicsof shunt, series and compoundgenerators- startingand speed control –lossesandefficiency.
ConstructionandPrincipleofoperationofsinglephasetransformers-e.m.fequation-phase diagrams-equivalentcircuit-regulation-lossesandefficiency.
Protective relays - Requirement of relay - types of protection - classification - distance relay, differentialrelay,staturelays.

ModuleII

Synchronousmachines-types-e.m.equation- windingfactors-armature reactionandleakage resistance.Synchronousmotor-methodsofstarting-applications.
Induction Motors - Construction and principle of operation - equivalent circuit - Torque - slip characteristics-methodofstarting-applications.
Circuitbreakers -function ofswitchgear-arcphenomenon-initializationofanarc-arc interruption-recoveryvoltageandrestripingvoltage-MCBandELCB. Faultsinpowersystems- causes-types.

ModuleIII

Fuses-types-selection-advantagesanddisadvantages.
Grounding - neutral grounding - solid grounding - resistance grounding - arc suppression coil grounding. Equipment grounding forsafety - grounding substation -grounding of line structure. Earthling
Effectofelectricandmagneticfields-Humansafetyaspects- effectofcurrentandvoltageonhuman beings-typicalV-Icharacteristicsofskin-Electricshocksandtheirprevention.
Insulation-classesofinsulation-FRLSimulation –continuitytest.

ModuleIV

Safetyduringinstallationofplantandequipment.Safessequences ininstallation –riskduring installation. Safetyduringtesting andcommissioning. Testonrelays – protectionandinterlock systems forsafety. Hazardouszones –classificationof hazardouszones. Intrinsicallysafe and explosion proofelectricalapparatus.Selectionofequipmentsinhazard subarea.
Electricalfires- hazardsof staticelectricity. Safeproceduresforelectricalmaintenance-Statutory requirements.SafetyprovisionsinIndianElectricityAct&Rules.

TextBooks

1. H.Cotton:ElectricalTechnology,WheelerPublishingCompany,1983.
2. Swan.H.W:ElectricalSafety

ReferenceBooks

1. S.L.Uppal:ATextbookofElectricalEngineering,KhannaPublishers,Delhi..
2. NSC,Chicago:AccidentPreventionManualfor IndustrialOperations
3.M.G.Say:ElectricalEarthingandAccidentprevention
4. S.Rao,and H.L.Saluja: ElectricalSafety,Fire EngineeringandSafetyManagement, KhannaPublishers,Delhi.
5.Indian ElectricityAct&Rules.

TypeofQuestionsforUniversityExamination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2toQ5: Two questions A & B of 15 marks from each module with option to answer either A or B.

406 FIRSTAIDAND EMERGENCYPROCEDURES

ModuleI

AimsandObjectives. FirstAidprinciples–Roleofthefirstaider-sequenceofactiononarrival at scene. Vitalsigns-breathing -pulse. Introduction to thebody-basic anatomicalterms-body cavities-head-cranium-thorax-abdomenandpelvis.

Biomechanics –Structureandfunctionsofmusculoskeletal systems,tendons,ligaments,facia, bone,muscles,jointsandbasicmechanisms.

The respiratorysystem-respiratoryfailure-asphyxia-abdominalthrust in Heimlich man oeuvre.Chestinjuries-types-fracturedribs -pneumothrox-haemothrox.

ModuleII

Thenervoussystem-functions-components-brain-cerebrum-cerebellum-medulla oblongata-cerebra -spinal fluid-spinal cord-autonomic nervous system. Unconsciousness-causes-level of consciousness-management of unconscious casualty- problems ofunconsciousness.Fainting-recognition-management-aftercare. Diabetes- hypoglycemia-hyperglycemias-management. Seizures (epilepticfits,convulsions) features-management,stroke.Headinjuries-fracturesofthebase-vaultandsidesofskull.

ModuleIII

The circulatory system-heat attack-chest compression- CPR

Shock-causes-signsandsymptoms- managementofshock.

Eye-eye injuries-foreignbodyineye-eye trauma-corrosive chemicalineye-arceye.Woundsbleeding-classification-typesofwounds-caseofwounds-bleedingfromspecialsites.

ModuleIV

Fractures–classificationoffractures-principlesofimmobilization–sprainsand dislocation.Broad andnarrowfoldbandages-handbandages-slings.

Theskin. Burns-rule ofnines-pure thermal burns. Electric burns. Chemical burns. Radiationburns.Coldburns.

Poisoning.Physicalfitness.Lifting-casualtyhandling.Useofstretchers.

References:

1)Manualoffirstaidtotheinjured :St.JohnAmbulanceAssociation.
2)Firstaidtextbook : AmericanNationalRedCross
3)ManualofFirstaidinstruction : USBureauofMines
4)V.V.Yudenich, AccidentFirstAid,MirPublishers,Moscow

TypeofQuestionsfor UniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5 : TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

407STRENGTHOFMATERIALSLAB

StandardtensiontestonM.SousingU.T.Mandasuitableextensometer

TorsiontestonM.SpecimenDou

blesheartestonM.Srod

ImpactTests–IzodandCharpy

Hardnesstests-Brinnel,VickersandRockwellhardnessTest onsprings

Testsonwood

1. Flexuraltest(b)Compressiontest

Compressivestrengthof masonryunits

(a)Bricks (b)Stone(c)hollowblockunits
Fatiguetest

Strut test

VerificationofClerkMaxwell's lawofreciprocaldeflection anddetermination ofYoung's Modulus.

Note: 50%marksisearmarkedforcontinuousevaluation,and 50% marksforendsemester examinationtobeassessedbytwoexaminers. A candidate shall secure minimum of 50%marks separatelyforthetwocomponentstobeelegible forapass inthatsubject.

408ELECTRICALTECHNOLOGYLAB

1. VerificationofKirschoff'sLaws

2. VerificationofSuperpositionTheorem

3.StudyofB.H.CurveonC.R.O

4. MeasurementofpowernapA.C.circuitby3ammeterand3voltmetermethod

5.Loadtestonad.c.seriesmotor

6.Speedcharacteristicsofthe c.shuntmotor

7.RegulationofaTransformer

8.Loadcharacteristicsofa3phaseinductionmotor

9.Studyofprotective relays andcircuitbreakers.

10.Studyofinsulationtestingandgroundtesting.

Note: 50% marks is ear marked for continuous evaluation, and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure minimum of 50%marks separately for the two components to bee legible for a pass in that subject.

501ENGINEERING MATHEMATICSIV<u>MODULE1</u>

Probabilitydistributions:randomvariables(discrete&continuous),Probabilitydensity, Mathematicalexpectation,meanand varianceof aprobability distribution,binomial distribution, Poisson approximation to the binomial distribution, uniform distribution, normal distribution.

Curve fitting: methodofleastsquares,correlationandregression,linesofregression.

<u>ModuleII</u>

Samplingdistributions:Populationandsamples,thesamplingdistributionofthemean XQNQRZQNQRZQWKHVDPSOLQJGLVWULEXWLRQRIWKHPHDQ WKHVDPSOLQJGLVWULEXWLRQRIWKHvariance, point estimation,intervalestimation,testsofhypotheses,nullhypotheses and Significancetests,hypothecisconcerningonemean,typeIandtypeIIerrors,hypotheses concerningtwomeans.Theestimationofvariances: Hypothesesconcerning onevariance-Hypothesesconcerning two variances.

<u>ModuleIII</u>

FinitedifferenceOperators:

Newton'sForwardandBackwarddifferencesinterpolationpolynomials,centraldifferences, Starlingscentraldifferencesinterpolationpolynomial.Lagrangeinterpolationpolynomial, divideddifferences,Newton'sdivideddifferencesinterpolationpolynomial.

Numericaldifferentiation:TrapezoidalandSimpson'srules,compoundedruleserrorsof Interpolationandintegrationformulae.Gaussquadratureformulae(Noderivationfor2point and3pointformulae)

<u>ModuleIV</u>

Numericalsolutionsofordinarydifferentialequations: Taylorseriesmethod,Euler'smethod, modifiedEuler's method,Runge-Kuttaformulae4thorderformule

Numericalsolutionofboundaryvalueproblems:Methodsoff invite differences,finitedifference methodsforsolvingLaplace'sequationinarectangularregion,finitedifferencesmethodsfor solvingthewaveequationandheatequation.

TEXTBOOKS:

ProbabilityandStatisticsforEngineers: IrvinMiller&FriendPrenticeHallOf India

NumericalMethods:S.S.Sastry,PhiPublishers.

REFERENCES:

NumericalMethods: P.Kandaswamy.K.Thilagavathy, K.Gunavathy, S.Chand &Co.

Probability,RandomVariablesandStochasticProcesses A.Papoulis,MghPublishers

<u>Typeof QuestionsforUniversityExamination</u>

Q1Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules.

Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

502CHEMICALENGINEERINGIII

ModuleI

Inorganicchemicaltechnology

Chloe - alkali industries-soda ash-caustic soda-chlorine-hydrochloric acid. Manufacture of sulphuric acid. Phosphorousindustries-phosphoricacid-wetprocessphosphoricacid, electricfurnace Phosphoricacid, singlesuperphosphateandtriplesuperphosphate.Nitrogenousindustries-ammonia, nitricacid,urea,ammoniumsulphate, ammoniumphosphate.

(Onlytheprocessescurrentlyinuseinindustriesneedbecovered)

ModuleII

Organicchemicaltechnology

Manufacturingprocessesforpulpand paper,sugar,industrialalcoholbyfermentation-absolute alcohol, beers,wines,oilsandfats,soapsanddetergents,agrochemicals,introductiontopolymers,syntheticrubbers-SBR,neoprene,urethanerubbers.

(Onlytheprocessescurrentlyinuseinindustriesneedbecovered)

ModuleIII

Bioprocessengineering

An overview of traditional and modern applications of biotechnologicalprocesses, outline of an integratedbioprocessandthevarious(upstreamanddownstream)unitoperationsinvolvedin bioprocesses,generalrequirementsof fermentationprocesses,typesoffomentersandbioreactors,auxiliary instrumentation of bioreactors, main parameters to be monitoredandcontrolled infermentationprocesses,Enzymes-mechanismofenzymeaction,introductiontoenzymekinetics,Michaelis-Menten kinetics,methodsofenzymeimmobilization.

ModuleIV

Chemicalplantdesignandeconomics

Processed signdevelopment- typesofdesigns,feasibilitysurvey,preliminarydesign,flow diagrams, piping and instrumentation diagram, batch versus continuous operation, factors in equipment scale up and design, equipment specifications.General design considerations- plant location,selectionof plant site, plantlayout.Detailedengineering- mechanical,structural,electrical and instrument designs. Capital cost estimates - fixed and working capital, cost escalation, cost indexes,estimatingequipmentcostsbyscaling.Selectionofmaterialsforchemicalplantconstruction underordenary temperatureandpressureandhightemperatureandpressureconditions.

TextBooks

1. M.GopalRao&M.Sittig(Eds),Dryden'sOutlinesof ChemicalTechnology,AffiliatedEast WestPress
2. MichaelL. ShulerandFikretKargi,BioprocessEngineering: Basic Concepts,Prentice-HallofIndia,2002.

ReferenceBooks

1. Max S.PetersandKlausD.Timmerhaus,Plant Design and Economicsfor Chemical Engineers,McGraw-HillBookCompany,2004.

2.G.T.Austin(Ed),Shreve'sChemicalProcessIndustries, McGrawHillBookCompany

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefourmodules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodule withoptiontoanswer either Aor B.

503PRINCIPLESOFENGINEERINGDESIGN

MODULEI

Introductiontodesign-stepsindesign-designfactors-practicalconsiderationsindesign- theorison failure-stressconcentration-considerationofcreepandthermalstressindesign.

Detachablejoints- design of screws- thread standards- thread stress- pre-loading of bolts- external loadwithpre-load-fatigueandshockloading-Typesofkeys-typesofpins-designofcotterandpin joint.

MODULE2

RivetedJoints-stressesinrivetedjoints-designofrivetedjointssubjectedtocentral&eccentricloadspoilerandtankjoints-structural joints.

Weldedjoints-typesof weldedjoints-designof weldedjointssubjectedto axial,torsionandbending loads.

MODULE3

Springs-stressesinhelicalspring-deflectionofhelicalcompressionandextensionSpring-springssubjected tofatigueloading-concentricandhelicaltorsionspring -critical frequencyofsprings-leafsprings-designof automotiveleafsprings.

Power Shafting- Design for static loads- combined stresses- design of shaft for strength and deflection-axialloadonshaft.

MODULE4

Designofcylindrical andsphericalvesselsforinternalandexternalpressures- designofheadsand enclosures-tallvessels-supportsforvessels-nonstandardflanges-pipelinedesign.Designof storage tanks.

REFERENCE

1.JosephEdwardShingley,MechanicalEngineeringDesign
2.V.I.Doughite,DesignofMachineelements
3.J.Myatt,MachineDesign
4.L.E.BrownellandB.H.Young,ProcessEquipmentDesign
5.M.V.Joshi,ProcessEquipmentDesign,
6.IS2825:1969-Codeforunfiredpressurevessels(tobepermitted forexamination)
7.DesignDataBooks(tobepermittedforexamination)
1Prof.B.R.Narayanalyengar&Dr.K.Lingaiah
2PSGTech.
3.Prof.Mahadevan

Type of Questions for University Examination

Q1.Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 toQ5: Two questions A & B of 15 marks from each module with option to answer either A or B.

504FIREENGINEERING-II

MODULEI

Effectoftemperature ontheproperties ofstructuralmaterials-concrete,steel,masonryandwood; Behaviorof non-structural materials on fire- plastics, glass, textile fibers and other house hold materials; Determination of combustibility by fire tube method; Brief description on noncombustibilitytestandclassificationofflamespredate ofmaterialsas per relevant standards(BIS). Compartmentfire-factorscontrollingfireseverity,ventilationcontrolledandfuelcontrolled fires; Spreadof fireinrooms,withinbuildingandbetweenbuildings..

MODULE2

Experimentaldeterminationof fireresistance-typesoffurnaces;Approximate methodsfor calculating the fire resistance of structural elements- Schematic diagrams, influencing factors; Concept of static, thermal engineering and experimental methods for the calculation of fire resistance;Principle of the calculationof the fire resistance limits of structures-coefficientof fire resistance,fireduration;Approximatecalculationoftherequirkedfireresistanceforabuilding.

MODULE3

Firearea-calculationofbuildingfirearea,subdivisionof fireareasinIndustrial,ResidentialandPublic buildings;Fireseparationbetweenbuilding-principles ofcalculationofsafedistance. Designprinciplesofire-resistant wallsand ceilings;Fireresistantscreens-solidscreensandwatercurtains; Localbarriers;First oppedareas-inproof,infire areas and inconnecting structures; Firedoors-Lowcombustible, NoncombustibleandSpark-proofdoors;suspensionofdoors;Air-tightsealingof doors;Specification,testandperformancecriteriaofPlate,MetalcoveredandRollingtypefired rsasper relevantstandards(ISI).

MODULE4

Fabricatedfireproofboards-calciumsilicate,Gypsum,Vermiculite,andPerliteboards;Fire protectionofstructuralelements-Wooden,Steel,RCC,andPlasticstructures; Reparabilityoffiredamaged structures-Assessmentofireseverity,Assessmentofdamagetoconcrete, steel,masonryandtimberstructures,Assessmentoffeasibilityofrepair;Repairtechniquesrepairmethodsto reinforcedconcreteColumns,beamsandslabs,Repairtosteelstructuralmembers,Repairtomasonry structures.

TextBooks

1. Roytman M. Ya., “Principles of Fire Safety Standards for BuildingConstruction”, Amerind PublishingCo.Pvt.Ltd.,NewDelhi,1975
2. Smith E.E. and HarmathyT.Z.(Editors),“Design of Buildingsfor fire safety”, ASTM Special Publication685,AmericanSocietyforTestingandMaterials,Boston,U.S.A.,1979.
3. E.GordenButcherE.G.andParnellA.C.,“Designingoffire safety”, JohnWileyandSonsLtd., NewYork,U.S.A.,1983

ReferenceBooks

1.MarchantE.W.,“ACompleteGuidetoFireand Building”,

2.AdamandCharlesBlack,“FiresafetyinBuildings”,

3.HMSO,“Fireprotectioninfactorybuilding”,

4. BIS, “IS-12777-Fire safety-flame-spread of products- Methodfor classification, Bureauof Indian Standards,NewDelhi,1989.
5. BIS,“IS3614(Part-1)-Specificationoffirecheckdoors-part1:Plate,metalcoveredand rollingtype”BureauofIndianStandards,NewDelhi,1966.
6. BIS,“IS3614(Part-2)-Specificationofmetallicandnon-metallicfirecheck doors-part2: Resistancetestandperformancecriteria,BureauofIndianStandards,NewDelhi,1992.

Type of Questions for University Examination

Q1.Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 toQ5: Two questions A & B of 15 marks from each module with option to answer either A or B.

505PRINCIPLESOFINDUSTRIALMANAGEMENT

MODULE I

Organization: Conceptoforganization , characteristics oforganization,elementsoforganization, organizationalstructure, organizationcharts, Types of organization-line &staff organization, functional organization,project organization,matrix organization,
Management:Functions,Evolutionofmanagementtheory,Principlesofscientificmanagement,

MODULEII

Personnel Management: Motivation theories, Leadership theories and models, Recruitment and training,laborturnover,operatortraining,
WagesandIncentives:featureofwages,timeandpiecerate,incentiveplans,proof itsharing.Jobevaluation,Merit ratingmethods-factorsofcomparisonandpointrating-defects.
IndustrialRelations:industrialdisputes,collectivebargaining,tradeunions,workers'participation in management,laborwelfare.

MODULEIII

Production Management: Production System-Functions-Product Design-Product Life Cycle. Demand forecastingforoperations-componentsofdemand-methodsofpredictionandforecasting-Forecastingmodels-casual&timeseriesPPC-Functions-Models
Capacity Planning - Evaluating future capacity - capacity requirement -Aggregate Planning
InventoryControl-Objectives-Costs-Models:Basic,Production,Shortage-ABCAnalysis.

MODULEIV

ProjectManagement:ProjectAppraisal –FeasibilityAnalysis,Marketfeasibility,Technical feasibility,Financialfeasibility,Economicfeasibility,FinancialandEconomicappraisalofaproject,Social Cost-BenefitAnalysisinIndia,ProjectReport.
ProjectScheduling:NetworkTechniques,PERT,CPM,GANTTcharts, GERT,Timecost trade offand crashingprocedure

References:

1.Buffa,E.S.,ModernProduction andOperations Management,7thedn.,JohnWiley andSons,1983.
2. PrasannaChandra.,Projects Planning,Analysis,Selection, Implementation&Re view,4thedn..,TataMcgraw Hill,NewDelhi,1995.
3.KootnzandDonnel.,PrinciplesofIndustrialManagement
4.MartandTelsang,IndustrialEngineeringand Productionmanagement.2nd edn.,S.Chand&Co.,NewDelhi

Type of Questions for University Examination

Q1.Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 toQ5: Two questions A & B of 15 marks from each module with option to answer either A or B.

506SAFETYINCONSTRUCTION

MODULE-I

Introductionto ConstructionIndustry- Safety issues in construction- Human factors in construction safety management. Roles of variousgroupsin ensuringsafety in constructionindustry.Framing Contractconditionsonsafety,andrelatedmatters.Relevanceofergonomicsinconstructionsafety.

MODULE-II

Safetyinvariousconstructionoperations-Excavation-under-waterworks-under-pinning&shoringLadders &Scaffolds- Tunneling- Blasting- Demolition- Pneumatic caissons- confined SpaceTemporary Structures. IndianStandardsonconstructionsafety-NationalBuildingCodeProvisionson construction safety.

MODULE-III

Safetyinmaterialhandlingandequipments-Safetyinstorage&stackingofconstructionmaterials.Safetyin theseofconstructionequipments-Vehicles,Cranes,TowerCranes,Liftinggears,Hoists&Lifts,Wire Ropes,Pulleyblocks,Mixers,Conveyors, Pneumaticandhydraulictoolsinconstruction.Temporarypower supply.

MODULE-IV

ContractLabour(R&A) Act and Central Rules: Definitions, Registration of Establishments, Licensing of Contractors,Welfareand Healthprovisionsin the Act and the Rules,Penalties,Rulesregarding wages. Building&OtherConstructionWorkers(RE&CS)Act,1996andCentralRules,1998:Applicability, Administration,Registration,WelfareBoard&WelfareFund,TrainingofBuildingworkers,GeneralSafety, Health&Well fareprovisions,Penalties.

References:

1.K.N.Vaid,ConstructionSafetyManagement.
2. V.J.DaviesandK.Tomasin,ConstructionSafety Handbook.
3. JamesB.Fullman,ConstructionSafety,Security&LossPrevention
4.LingerL,ModernMethodsofMaterialHandling
5. R.T.Ratay,HandbookofTemporaryStructuresinConstruction.
6. NationalBuildingCodeofIndia
7.RelevantIndianStandardspublishedbyBIS
8. ContractLabourActandCentralRules
9. Building&OtherConstructionWorkers(RE&CS)Act,1996andCentralRules.

Type of Questions for University Examination

Q1.Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 toQ5: Two questions A & B of 15 marks from each module with option to answer either A or B.

507SAFETYENGINEERINGLAB

1. StudyofPPE's.

2.Assessmentofthesafetyperformance inanindustryandpreparationofreport..

3.AccidentinvestigationandAnalysis-Exercises

4.Jobsafetyanalysis-Exercises

5.Safetysurveyofalaboratory.

6.Safetyaudit ofalaboratory.

7.Calculationofcostofaccidents.

8.Preparationofworkpermits.

9.Safetyassessmentinaconstructionsite.

10.Designanddevelopmentofa trainingmoduleonanytopicofsafety.

11.PreparationofaP&IdiagramusingAutoCad.

12.PreparationofthelayoutofachemicalplantusingAutoCad.

Note:50%marksisearmarkedforcontinuousevaluation,and50% marksforendsemester examinationtobeassessedbytwoexaminers.A candidate shall secureminimum of 50%marks separatelyforthetwocomponents to beelegible forapass inthatsubject.

508CHEMICALENGINEERINGLAB

1.SieveAnalysis-Toanalysesagivensampleusingasetofstandardsievesandthusto determinethespecificsurfacearea,thevolumesurfacemeanddiameterandthemas mean diameterbydifferentialanalysisandcumulativeanalysis.

2.StudyoftheworkingofPlateandframefilterpress.

3. Freesettling-Tofindoutthedragcoefficientofafallingsphereinafluidandverificationof Stoke'slaw.

4.Sedimentation-Tostudybatchsedimentationofaslurryandtodeterminetheareaofthe continuousthickener.

5.Heattransferfromsteamtoair-Determinationofoverallheattransfercoefficient.

6.VerificationofmaterialbalanceequationandRayleigh’sequationforsimpledistillation.

7. Steamdistillation.

8.Leaching-leaching mixtureof saltand sand.

9.Studyofthekineticsofchemicalreactioninabatchreactor.

10.Adsorptionisoterms.

11.Frequencyresponse offirstandsecondordersystems.

Note:50%marksisearmarkedforcontinuousevaluation,and 50%marksforendsemester examinationtobeassessedbytwoexaminers. A candidate shallsecurea minimum of 50%marks separatelyforthetwocomponentstobeelegible forapass inthatsubject.

601LEGALASPECTSOF SAFETY,HEALTHANDENVIRONMENT

MODULE-I

Factories Act- Definitions, Preliminary, Inspecting staff, Health, Safety, Provisions relating to hazardous processes,Welfare,Workinghoursofadults,Employment ofyoungpersons,Special provisions.
Dock workers (Safety, Health and Welfare)Act and Regulations - Definitions, Powers of Inspectors,PowerofGovt.todirectInquiry,Obligationofdockworkers.DutiesofSafetyOfficers,Reporting ofaccidents,EmergencyActionPlan,SafetyCommittee.

MODULE-II

Workmen'sCompensationAct:Definitions,Employer'sliabilityforcompensation,Calculationofamount ofcompensation.ESIActandRules:ApplicabilitytoConstruction,DefinitionsandBenefitsas pertheAct&theRules.
Public Liability Insurance Actand Rules- Definitions, Calculation of amount of relief, Environmental ReliefFund,AdvisoryCommittee,Powersof DistrictCollector,ExtentofLiability, ContributiontoReliefFund.

MODULE-III

ExplosivesActandRules-Definitions,Categories ofExplosives,GeneralSafetyProvisions,Useof ExplosivesGrantoflicense,NoticeofAccidents,Inquiryintoordinaryandmoreseriousaccidents,Extension ofdefinitionto otherexplosive substances.
PetroleumAct&Rules-Definitions,ControloverPetroleumimport,transport,storage,production,refining andblending,Needforlicense, exemption,NoticeofAccidentsandInquiries.

MODULE-IV

Water Act- Definitions,Powers and Functions of Boards, Provisions regarding prevention and controlof waterpollution, Powerto make rules,Ruleson Consentfor Establishmentand Operation. AirAct-Definitions,Power&FunctionsofBoards,Prevention&ControlofAirPollution, Consent asper AirPollutionRules.Environment (Protection)Act and Rules- Definitions,generalpowersof central government, prevention, control and abatement of environmental pollution, standards for emission, prohibition and restrictions on sittingand operation of industries. MSIHC Rules- Definitions, Duties of Authorities, Notification of Major Accidents Safety Reports, Safety audit, MSDS,On-site&Off-siteEmergencyPlan,Givingsafetyinformationtopublic.

Reference
s

1.FactoriesAct,1948withaamendments of1976&1987.
2.DockWorkers(SHW)Act,1986;Rules,1990&Regulations,1990.
3.ExplosivesActandRules.
4.PetroleumActandRules.
5.EnvironmentalActs&Rulesasabove.

Type of Questions for University Examination

Q1.Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 toQ5: Two questions A & B of 15 marks from each module with option to answer either A or B.

602CHEMICALPROCESSSAFETY

MODULEI

SAFETY IN THE DESIGN OF CHEMICAL PROCESS PLANTS :-Design principles-reliability andsafetyindesigning-inhe rentsafety-engineeredsafety- pipingand instrumentation-safety duringstartupandshutdown-safetychecksinthedesignoftheequipments-reactorsafety-safety inerectionandcommissioningofchemicalplants-nondestructive testing methods -pressureand leaktesting-emergencysafetydevices-scrubbersandflares-newconceptsinsafetydesignandoperation-Pressurevesseltesting'sstandards-Gassylenderrules,SMPRules-Inspectiontechniquesforboilersand reactionvessels.

MODULEII

SAFETY IN THE OPERATION OF CHEMICAL PROCESS PLANTS:- Properties of chemicals - Material Safety Data Sheets - the various properties and formats used - methods available for property determination. Operational activities and hazards -standards operating procedures - safe operationof

pumps, compressors, heaters, column, reactors, pressure vessels, storage vessels, piping systems-effectsofpressure,temperature,flowrateand humidityonoperations- corrosionand control measures-conditionmonitoring-controlvalve-safety valves-pressurereducingvalves, drains,by passvalves,inertgases.Chemicalsplashes,eyeirrigationandautomaticshowers.

MODULEIII

SAFETY IN THE STORAGE AND HANDLING OF CHEMICALS AND GASES :-Types of storage-general considerations for storage layouts- atmospheric venting, pressure and temperature relief -reliefvalve sizing calculations- storageandhandlingof hazardouschemicalsand industrial gases, safe disposalmethods,reactionwith other chemicals,hazardsduringtransportation-pipeline transport-safetyinchemicallaboratories. Safetyprovisionslikeleveland flowindictators- alarms, trips- protectionof stills,columnsand towarsfromlightening- colorcodingfor pipe linesand cylinders.

MODULEIV

CHEMICAL REACTIONHAZARDS:Hazardous in organicandorganicreactionsandprocesses, Reactivityasaprocesshazard,Detonations, Deflagrations, andRunaways,AssessmentandTesting strategies, Self-heatinghazardsofsolids,Explosive potentialofchemicals, Structuralgroupsand instabilityofchemicals,Thermochemical screening,Casestudies. Stabilityandsensitivitytests, Classificationofmaterialswithexplosivepotential,Hazard prediction by thermodynamic Calculations, Preventionandcontrolof explosionsanddetonations-diluting arelease,purgingandinserting, venting, explosionrelief, flame arrestors, explosionsuppression, Classificationofhazardousareas.

References:

RalphKingandRonHirst,King'sSafetyintheProcessIndustries, Arnold,London,1998
IndustrialEnvironmentanditsEvolutionandControl :NIOSH
Accident PreventionManualforIndustrialOperations :Vol.I&IINSCChicago
SaxNIrvin,Dangerouspropertiesof industrialmaterials

Typeof QuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefourmodules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswereitherAor B.

603PROCESS INSTRUMENTATIONAND CONTROLENGINEERING

Module I

Elementsofmeasurement- Fundamentalstandards,Qualityof measurement,Meaningof measurement, Errorsinmeasuringinstruments, Precisionandaccuracy,Calibrationprinciple,Staticand dynamiccharacteristicso fem. assuringinstruments.

Measurement of temperature - Bimetallic and pressure thermometers, Thermocouples, Resistance thermometers,Pyrometer,Calibration.

Pressureandvacuummeasurement- Manometers,Measuringelement,Absolutepressure measurement,Staticaccuracyofpressuregauges.

ModuleII

Flowmeasurement-Orificeinstallation,Picot tube,Areaflowmeters,Openchannelmeters.Level measurement-Directmethod,Measurementoflevelinopenandpressurevessels.Measurementof PHandhumidity.

RecordingInstruments,Indicatingandsignalinginstruments,Signaltransmission,andcodes.

ModuleIII

Open loop and close loop systems - Transferfunction modeling- block diagramrepresentationof mechanical,thermalandliquidlevelsystems.

Transientresponseanalysis-Timeresponseoffirstandsecondordersystemforimpulse andstepinputs-Effectofdampingfactorsontransientresponse-Characteristicsofproportional,integral,derivative,PI,PD andPIDcontrollers.

Frequencyresponsemethodofanalysis-polar plot-BodePlot.

ModuleIV

Introductiontostability-Definitionviaimpulse responsefunction-Routh-Hurwitzstabilitycriterion -SyQuest stabilitycriterion.

Controlsystemcomponents-errordetectors-modulatorsanddemodulators-Hydrauliccontrollers -Pneumaticcontrollers-PLC.

Introductiontocomputercontrolinchemicalprocessindustry.

Compares onbetweendiscrete data, digitalandanaloguecontrolsystems.Introductiontodigitalsignal processing.

TextBooks

1. DPatranabis, Principles of Industrial Instrumentation,SecondEdition,TataMcGraw-Hill PublishingCompanyLtd,NewDelhi,1996.
2. GeorgeStephanopolous, ChemicalProcessControl :AnIntroductiontoTheoryand Practice, PrenticeHallofIndiaPvt. Ltd,1990.

References

1.EckmanDP,IndustrialInstrumentation,WileyEasternLtd,NewDelhi,1990.

2.Ogata,K.,ModernControlEngineering,PrenticeHall,1995.

3.BenjaminC.Kuo.,DigitalControlSystems,OxfordUniversityPress,1992.

4.Stefani R.T, Shahian B,Savant J.CandHostetter G. H, Design ofFeedback Control Systems,OxfordUniversityPress,2002.

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefourmodules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

MODULE-I

604FIREEN GINEERING-III

Firedetection-Needand importanceof automaticfiredetectionsystem,principleofdetection, classificationofdetectors;Heatdetectors-fixedtemperature,rateofrise,thermistorrateofriseandrate compensatedtypederectors;Smokedetectors-opticaland ionizationtype,photoelectriclightscatteringand lightobstruction typedetectors;Flamedetectors-infraredandultravioletdetectors; Flammileagesdetection-Ellistonandlaserdetectors;Testingoffiredetectiondevicesasperrelevant Indian standards(ISI);Comparisonofdetectors;Performancecharacteristicsofdetectors;Lag time associatedwith firedetection.

MODULE-II

PrinciplesofFire Extinguishments-extinctionofpremixedflames,diffusionflamesandburningmetals, firetriangle,firetetrahedron;Basicconceptoffirefightingwithwater,carbondioxide,powders,foams, inertgaseshalons;Needforaloneplacementandhalosubstitutes;Extinguishantperformance-flame extinguishingconcentration,invertingconcentration,firetrials.

Firstaidfireprotection-firebucketsandbucket,fireblanket,firepails& waterbarrels,hosereels; Description,workingprinciple,methodofoperationofdifferenttypesofportablefireexitingusherswatertype, foamtype,drypowdertype,CO_2type,vaporizingliquidtype;Care,inspection,andmaintenanceof portableextinguishers;

MODULE-III

Automatic water sprinkler system- requirement and source of water supply, automatic pumps; Automaticsprinklerheads-Quartzoidtype,fusiblelinktype,moderntypes;mountingandprotectionof sprinklerheads;Sprinklerpipeworks-standardandstaggeredlayout,hangers;Controlvalvesforwetanddry installations;delugevalve.Drenchers;High velocityandmediumvelocityspraysystem;Principlesofsprinkler systemdesignasperrelevantstandards(ISI).

FixedfirefightingsystemusingCO_2,Drychemicalpowder,andFoam-conceptoftotalfloodingand localapplication,advantagesanddisadvantages ofeachsystem;Basicsystemcomponents;Design principlesof fixedfirefightingsystemsfortotalfloodingandforlocalapplicationasperrelevant standards(ISI).

MODULE-IV

Firealarm system-classificationofalarmsystemasperNBC;Manuallyoperatedsystem;Automatic alarm system;ComponentandfeaturesofLocalsystem, Auxiliarysystem,Remotestationsystem,Centralstation systemandProprietarysystem

Firegroundoperations-preplanning, actiononarrivalandcontrol,methodsofescue,methodsofentry. Personnelsafety. Controlprocedureanduseofothersafetyequipment. Ventilation andsalvage operations.

TextBooks

1.Ron Hirst, “Underdowns Practical Fire Precautions”, Gower Publishing Company Ltd., England,1989.

2.JainV.K.,“FireSafety inBuildings”,NewAgeInternational(P)Ltd.,NewDelhi,1996

3.Clark,W.E.,“Firefightingprinciples&practices”,

4. HMSO: Manualof Firemanship,No.4to7.

ReferenceBooks

1.KevinCassidy,“FireSafety and lossPrevention”,

2.NFP A,“FireProtectionHand Book”,

3.HubertWalker,“Preventivemaintenance/Apparatus”,

4.ErvinL.W.,“Firefightingapparatusandprocedures”,

5.FireservicesmanualVol1&Vol2

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5marks eachwithtwoquestionsfromeachofthefourmodules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

605 ENVIRONMENTAL ENGINEERING AND MANAGEMENT

ModuleI

Airpollution-Sourcesofairpollution,effectsofairpollution ,classificationofpollutants,Atmospheric transport of pollutants-wind profiles, atmospherestability, inversion, turbulence, dispersion and diffusion of air pollutants, Gaussian plume dispersion model. Principles and techniques of ambient air and stack emission monitoring; Particulate matter control equipment-workingprinciplesofgravitysettlers,cyclones,wetscrubbers,fabricfiltersandelectrostatic precipitators;Gaseouscontrolmethods-anoverviewofabsorption,adsorptionandcombustionmethods; BiologicalmethodsforVOCandourcontrol.

ModuleII

Physical, chemical and biologicalcharacteristicof waste water; Effects of pollutant sonwater quality and aquatic life; Physical unit operationsinwaste water treatment- flow equalization,sedimentation, and flotation; Chemical unit processes in waste water treatment- coagulation and flocculation, chemical precipitationand adsorption; Biological unit processes-kinetics of microbial growth, Aerobictreatmentsystems:workingprincipleanddesignparametersof trickling filter,activated sludge process, and rotating biological contactor; Anaerobic treatment systems: mechanism of anaerobicprocess,lowrateandhighratedigesters, workingprincipleandapplications of anaerobic filters and UASB; Biological nitrification -gentrification; Characteristicsand treatment methods for thewastewaterfromfertilizerplants,petroleumrefineries,pulpand peppermills anddistilleries.

ModuleIII

Solidwastes-environmental,aestheticandhealthrisk;Sources,quantitiesandcompositionofsolidwastes; Storage,collectionandtransportationofurbansolidwaste, disposaloptions-sanitarylandfills,composting and its variations, anaerobic digestion, incineration and paralysis; Vermicomposting; Recovery alternativeMonitoring ofsolidwastes. Hazardouswastes-definitionandclassification, healthand environmentaleffects, treatment, disposalandmanagement of hazardouswastes, legalframeworkfor hazardouswastmanagementinIndia.

ModuleIV

Environmentalmanagementinindustries-PrinciplesandrequirementsofISO 14001EMS; Environmental auditing and auditing for waste minimization; Environmental impact assessment-descriptionof the environmentalsetting, prediction and assessment of impacts, methods of impact analysis,Indianscenario,publicparticipateoninenvironmental decisionmaking.Strategies for pollutionprevention -recycleandreuse, cleaner technologies. Lifecycleassessment -principleand methodology. Theconceptofindustrialecology. Cleandevelopmentmechanism(CDM)-carbon trading.

TextBooks:

1. C.S.Rao: EnvironmentalPollution ControlEngineering, NewAge International(P)Ltd Publishers,1991.
2. M.N.RaoandA.K.Dutta: WastewaterTreatment, Oxford&IBH PublishingCo.Pvt. Ltd, NewDelhi,1987.**:**

References

1)Pavani,J.L: HandbookofsolidwasteDisposalandManagement
2)MetcalfandEddyInc.: WasteWater Engineering:Treatment,Disposal,Reuse
3) Canter.L.W:EnvironmentalImpactAssessment
4)Liu,I(Ed).:EnvironmentalEngineersHandbook(2nd Edn)

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markeachwithtwoquestionsfromeachofthefourmodules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

606OCCUPATIONALHEALTH ANDHYGIENE MANAGEMENT

MODULE I

Conceptand spectrumofhealth- functionalunits and activitiesof occupationalhealthe services- occupational and work related disease- Levels of prevention of diseases - notifyable occupational diseasessuchas silicosis, asbestosis,pneumoconiosis,siderosis,anthracnose,aluminizes andanthrax- Lead-Nickel,chromiumandmanganesetoxicity-gaspoisoning(suchasCO,ammonia,coalanddust), theireffects andprevention-Industrialtoxicology-localandsystemicandchroniceffects, temporary and cumulative effects - threshold limit values, calculation of TLVs - carcinogens, mutagens,teratogens.

MODULEII

Recognition,evaluationandcontrolofphysicalhazards.Vibration-description andmeasurementof vibration.Vibrationcontrolmethods.Effectsofwholebodyvibrationonhumanbodyandcontrol measures.

Noise- noisemeasurement, evaluation, noisecontrol methods-hearingloss-causes-Biologicaleffects ofnoiseexposure.

Thermalstress-heatdisordersandhealsthe effectssuchasheated exhaustion,head rcrampetc.WBGT index, acclimatization.

Ventilationsystems -purposeofventilation-generalprincipleventilationrequirements.

Physiologicalandcomfortlevel. Natural ventilation-Dilutionventilation-Mechanical ventilation- Local exhaust ventilation - Ventilation measuring instruments.Fundamentals of hood and duct designs.Standardsonventilation.

MODULEIII

Man as a system component-allocation of functions-efficiency-occupationalwork capacity-aerobic andanaerobicwork-steadystate-evaluationofphysiologicalrequirementsofjobs-parameters of measurements- categorizationofjob heaviness-workorganization-stress-strain-fatigue-restpauses-

-audiometric test- hearingconservationprogrammed -vision test- vital functiontest- pre-employment and periodicemploymentmedicalexaminations. Biologicalrhythms,shift workand occupational health..

Purposeof lighting.Advantagesofgoodillumination. Lightingandthework. Sourcesandkindsof artificiallightingprinciplesof goodillumination.Design of lightinginstallation.Maintenance. Lightingandcolor.Standardsonlightingandilluminations.

MODULEIV

Biological hazards- agents- types sources and prevention. Recognition, evaluation and control of chemical hazards-types-dust-fumes-mist-vapor- fog etc., air contaminants- evaluation - types of sampling - airsamplingsystem-methods of analysis-controlmeasures. Ionizingand no ionizingradiation, Radiationprotection. Instrumentsfor Radiationdetectionand measurement. Early recognitionofradiationhazard-personalmonitoringdevices,Medicalsupport. Hazardsassociatedwith thefollowing radiationsandpreventivemeasures- Laser, infrared,ultravioletand ELF.Personal protectionintheworkingenvironment,TypesofPPEs,Personalprotectiveequipmentrespiratoryandnon respiratoryequipment.StandardsrelatedtoPPEs.

REFERENCES

1.EncyclopaediaofOccupationalHealthand Safety :VolI&II-ILO
2.Industrial Environmentanditsevaluationand control :NIOS
3.DHunter,DiseasesofOccupation.
4.M.K.Poltev,OccupationalHealth&Safetyinmanufacturingindustries.
5.Clayton&Clayton,Patty'sIndustrialHygieneandToxicology :

TypeofQuestionsfor UniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefourmodules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswereitherAor B.

607ENVIRONMENTALENGINEERING&MANAGEMENTLAB

1.Determination of pH,turbidity, total hardness, total solids and dissolved oxygen of water samples.

2.DeterminationofBODandCODof waste watersamples.

3.Jar testfordeterminingtheoptimumcoagulantdosefor watertreatment.

4.Determinationofkineticconstantsofactivatedsludgeprocess.

5.Determination of sculpturedioxide,oxides of nitrogen and particulate matter fromchimney sources.

6.Determinationofparticulatematter, chlorine,ammonia, carbon monoxideandsulphurdioxide inambientair.

7.Analysisofleadandotherheavymetalsinairusingsectorscopy.

8.Studyofpollutionpreventionandcontrolfacilitiesinindustries.

9PreparationofEnvironmental ImpactStatement(EIS)foranindustrialproject.

10.PreparationofanEnvironment AuditReport.

Note:50%marksisearmarkedforcontinuousvaluation,and50%marksforendsemester examinationtobeassessedbytwoexaminers. Acandidate shall secureminimum of 50%marks separatelyforthetwocomponentstobeelegible forapass inthatsubject.

608MINORPROJECT

Eachbatchcomprisingofaround5studentsshall identifyaprojectrelatedtothe curriculumofstudy. Atthe endofthesemester,eachstudentshallsubmitaprojectedportcomprisingoftheapplicationandfeasibility oftheproject.

Guidelinesforevaluation:

1.Attendanceandregularity	20
2.Theoreticalknowledgeandindividualinvolvement	30
3.Qualityandcontentsofprojectreport	30
4.Presentation	20
	100Marks

701HAZARDIDENTIFICATIONANDRISKASSESSMENT

Module I

Hazard and risk, Types of hazards-fire,explosionandtoxicgasrelease,Structureof hazard identificationandriskassessment.

Identification of hazards: Inventoryanalysis, Fireandexplosionhazardratingofprocessplants-TheDowFireandExplosion HazardIndex, The MondIndex, Plantlayoutandunitthezardrating, Preliminary hazard analysis, Hazardand Operabilitystudy(HAZOP),WhatIanalysis, Case studies.

ModuleII

Plantavailabilityand processreliability: waysofimprovingplantaviolability ,MTBFandMTTF, the reliability function, failure rate, bathtub curve, probability relationships, simple reliability estimation.

Estimationoffrequencyofoccurrenceofahazard:Thelogictreeapproachsettheoreand Boolean algebra,applicationtoprobability,Booleanmanipulation.

Faulttreeanalysis-logicsymbols,minimalcutset,logicgates,faulttree quantification.

Eventtreeanalysis-notation,eventtreeconstruction,advantagesanddisadvantagesofETA.

FailuremodeandEffectAnalysis(FMEA) -methodology,criticalityanalysis, correctiveaction andfollow- up.

ModuleIII

Consequencemodeling:

Sourcemodels-dischargeratemodels,flashandevaporation,dispersionmodels.

Explosionsandfires-vaporloudexplosions, flashfires,physicalexplosions,BLEVEandfireball, confinedexplosions,poolfires,jetfires.

Effectmodels-dose-responsefunctions,probitfunctions, toxic gas effects,thermaleffects, explosioneffects-Softwareapplicationforeffectanddamagecalculations.

ModuleIV

Quantificationofrisk:QRA,Vulnerabilityanalysis,acceptedandimposedrisk,perceptionofrisk, risk indices,individualriskandsocietalrisk,acceptance criteria forrisk,ALARP,Presentationof measuresofrisk-riskcontour,F-Curve.Calculationofindividualriskandsocietalrisk.

Humaneliabilityanalysis(HRA): factorsleadingtohumanerror, characteristicsofHRA techniques, TechniqueforHumanErrorRatePrediction(THERP), AccidentSequenceEvaluationProgram (ASEP),Techniquesusingexpertjudgment,OperatorActiontree(OAT).

TextBooks

AIChE/CCPS, GuidelinesforHazardEvaluationProcedures secondedition.Centre forChemicalProcessSafety, AmericanInstituteofChemicalEngineers,NewYork, 1992.

AIChE/CCPS, GuidelinesforChemicalProcessQuantitative RiskAnalysissecond edition.Centrefor ChemicalProcessSafety, AmericanInstituteof Chemical Engineers,NewYork,2000.

References

1.LeesF.P.LossPreventioninthe ProcessIndustriessecondedition. Butterworth's,London,1996.

Type ofQuestionsfor UniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefourmodules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

702 SAFETYINRAILANDROADTRANSPORT

MODULEI

RailwayEngineering:Permanentway-Components:Rails-Functions,requirements,defects,rail jointsand fastendings,checkandguardrails,coningofwheels,creepfrails;Sleepers-functions,requirements,types, density;Ballast-functions,requirements,types.
GeometricDesign-Horizontalcurves, Super-elevation,Negativesuper-elevationin branches,Length of transitioncurves-Gradecompensationoncurves-Wideningofgaugeoncurves.

MODULEII

Railwayoperation&control:Pointsandcrossings-Turn-out-TypesofRailwaytracks-PointsStation YardsandMarshallingYards-Signalingandinterlocking-PrinciplesoftrackcircuitingControloftrain movementbycentralizedtrafficcontrolsystem.RailwayAccidents&Safety.RapidTransitRailways-types, merits&demerits.

MODULEIII

Classification of highways-Typical cross-section of roads- Definition of various cross-sectional elements- Requirements&factors controllingalignmentof roads- Basic geometricdesign of streets andhighways.

MODULEIV

Traffic characteristics-various traffic studies and their applications-Traffic signals- Classificationof signals- Carriage-way markings- Traffic islands- Highway intersections- Principles of highway lighting- Accident prevention, investigation and reduction- Road Accidents- Regulatory measures for traffic management- Physical methods of traffic control- Traffic Calming- Safety Audit, Intelligent TransportSystem.

References:

1.S.C.Rangwala,RailwayEngineering
2.S.K.KhannaandC.E.G.Justo,Highway Engineering
3.L.R.Kadiyali,TrafficEngineeringandTransportPlanning.
4.MikeSlinn,PeterGuestandPaulMathews, Traffic EngineeringDesign: Principles and Practice, Butterworth-HeinemannElsevier.
5.R.Agor,RailwayTrackEngineering,KhannaPublishers.

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

703SAFETYINENGINEERINGINDUSTRY

ModuleI

IntroductionClassificationofEngineeringIndustryManufacturingProcesses
Hot Working-Foundry operations-furnace and equipments, health hazard, safe methods of operation. Forgingoperations,heat radiation,maintenanceofmachines, shopequipmentsand handtools-safe workpractice.Operationsinhotandcoldrolling mills.

ModuleII

Machinery safeguard-Point-of-Operation,Principle of machine guarding - breakdown of machineguarding-typesofguardsanddevices.
ColdWorking-SafetyinPowerPresses,primary&secondaryoperations-shearing-bending -rolling-drawing.MetalCutting-safetyinturning,boring,milling,planningandgrinding. Maintenanceofmachinetools-healthhazardsandprevention.

Module III

WeldingandCutting-Safety PrecautionsofGasweldingandArcWelding, Cutting and Finishing.Gas Cylinders and Equipments. Heat Treatment- Furnacesand Salt baths-operationsandmaintenance-safetyinhandling andstorageofsalts-disposalofeffluents- health precautions, exposure to hazardous fumes, sourceof fumes, ventilation and fume protection.

ModuleIV

MaterialHandling-Classification-safety consideration-manual andmechanical handling. Handling assessments and techniques- lifting, carrying, pulling, pushing, palletizing and stocking. MaterialHandling Equipments-operation &maintenance. Maintenanceofcommon elements-wirerope,chainsslings,hooks,clamps.

Reference

1.Accident PreventionManual for IndustrialOperations:National SafetyCouncil, Chicago
2.RolandP.Blake,IndustrialSafety
3.NCBalchin,HealthandSafetyinWeldingand Alliedprocess,Juice Publishers
4.N.Srinivasan,SafetyinEngineeringIndustry,VijayConsultantServices,Chennai
5.S.Kalpakjianand S.R.Schmid, Manufacturing Engineeringand Technology,Pearson EducationAsia

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

704FIREENGINEERINGIV

MODULE-I

Processofemergencyevacuation-specialfeaturesofpersonnelmovement. Parametercharacteristicsof the movementof people-practicalmethods of designing evacuationpassages and exists. Evacuationexits androutes-stagesofevacuation;ExitRequirements-Planningofevacuationroutesandexits-Seating arrangement-Passagesandcorridors;Smokecontrolduringbuildingdesign;MechanicalVentilation; Compartmentfiresandtacticalventilation.

MODULE-II

Classificationofbuildingbasedonoccupancy;Firezone;classificationoftypeofconstructionaccording tofireresistance;Generalfiresafetyrequirementsapplicabletoallindividualoccupancies.Sittingofdetectors aspireevantstandards(ISI);Selectionandplanningofalarmsystemasperrelevantstandards(ISI). Generalrequirementsandguidelinesfortheinstallationoffiredetectionandalarmsysteminbuildingsof differentoccupancyclassification.

MODULE-III

GeneralexitrequirementsasperNBC;Internalstaircases;Pressurization ofstair staircases;horizontalexits;fire tower;ramps;firelifts;externalfireescapeladders;Planning oflocationandcalculationofcapacity,number andwidthofexitasperNBCfordifferentoccupancyclassification.

MODULE-IV

Selectionanddistribution ofportableextinguishers (forclassAandBfires)andotherfireprotection equipmentsandsystemsfordifferentoccupancyclassificationasperNBC;Planning offixed firefighting installationfordifferentoccupancyclassification-sprinklersystem;totalfloodingsystem;CO_2 system; foam system; Fire training and education- Arson - Fire safety audits - Risk assessment - Fireinsurance .FireInvestigation

TextBooks

1. Roytman M. Ya., “Principles of Fire Safety Standards for BuildingConstruction”, Amerind PublishingCo.Pvt.Ltd.,NewDelhi,1975
2.E.GordenButcherE.G.andParnellA.C.,“Designingoffire safety”, JohnWileyandSonsLtd., NewYork,U.S.A.,1983.
3. BIS,“NBCPart4-Fire and Lifesafety”, BureauofIndianStandards,NewDelhi,2005.

ReferenceBooks

1.MarchantE.W.,“ACompleteGuidetoFireand Building”,
2.AdamandCharlesBlack,“FiresafetyinBuildings”,

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

705(A)AUTOMOBILEENGINEERING&SAFETY

ModuleI

Typesofautomobiles.LimitingDimensionsasperCentralMotorVehiclesRules.Engines -Classification,Construction,Materialsofenginecomponents. PrototypeTestingasperCentral MotorVehiclesRules.
Fuel System -Fuel tank, Fuel filter, Types ofFuel system Carburetor -Simple and Modern,Fuel injectionSystem.EmissionStandardsasperCMVRules.

ModuleII

ElectricalSystem- StorageBatteryOperationsandMaintenance. IgnitionSystem- Coiland MagnetoIgnitionSystem. Starting System,Lighting System,Horn System- WindShieldWiper Motors,Fans,Heaters,Eradicators.Automobileairconditioning.CentralMotorVehicles RulesregardingLighting,Windshields,Wipers.

ModuleIII

Transmission System - Clutches - operation and fault finding of clutches, Fluid Flywheel, Gear Box-types, Steering Systems, Chassis Springs, Suspension. Differential, Dead and Live axles,Rims,Type etc.Brakes-Types,constructionandfaultfinding.CMVRules-Brakes, Steering&Type.

ModuleIV

LubricationSystems- Types,Components,Lubricatingoil,Coolingsystem-Detailsof components,StudyofSystems,Types. Miscalls igneous-Specialgadgetsandaccessoriesforfire fighting vehicles. Automobile accidents. CMV Rules regarding Safety devices fordrivers, passengers.

References:

1)William H. Crouse, AutomobileChassis and BodyConstruction, OperationandMaintenance.
2)WilliamH.Crouse,AutomobileMachines-Principles&Operations.
3)GBSNarang,AutomobileEngineering
4) KirpalSingh,Automobile Engineering
5)JosephHeitner,AutomotiveMechanics-Principles&Practices
6)P.L.Kohli,AutomotiveElectricalEquipments.
7)TheCentralMotorVehiclesRules,1989

TypeofQuestionsforUniversityExamination

Q1Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

(B)SAFETYINPETROLEUM&PETROCHEMICALINDUSTRIES

Module-I

Simplifiedflowdiagramsofatypicalrefinery- distillation unit,cattily tic cracker,reformer,treatingunit (hydroforming,gaspurification,Sulphurrecovery,lubricating oilunit) Simplifiedflowdiagramsof Petrochemical Industry-steamcracking,butadieneextraction,ethanerecovery,butylrubber polymerization.

Module-II

Potential fire hazards in petroleumand petrochemicalindustries(ignitionby local sources, spark, flame, hot surface, ignition of oil mists and fumes.). Storage tank farms of petroleum and petrochemicalindustries-IdentificationofHazards,TypeofTanks,Design,Layout,Fireprevention measuresincludinglightningprotection.Fireprotectionarrangements inlargetankfarms,Design concepts of various fixed fire protection systemslikeFoam- Water Systems, Halogen &DCP systems.Lockoutprocedures.Salientfeaturesofcodes/standards:NFPA,API,OISDandSHELL.

Module-III

Fireprotectionfacilities inOilRefineries,Depots&Terminals-Transportationof petroleumand petrochemical products(safetyconsiderations,statutoryconsiderations). DesignandConstruction requirementsforcrosscountryhydrocarbon pipelines.LiquefiedPetroleumGas(LPG)BottlingPlant Operations.Design Philosophies.OperatingPractices-Safety and Fire Protectionin bottling plants. InternalSafetyAuditsin(ProceduresandChecklist)TransportationofBulkPetroleumProducts. StorageandHandlingofBulkLiquefiedPetroleumGas.

Module-IV

On-ShoreandOff-shoredrilling.Classification ofwells.Drillingmethod.Rotarydrilling.Drilling equipment. Ground and offshore structures for drilling. Offshore platforms and drilling vessels. Drilling mud - functions, classification and properties. Blow-off, well kicks, Blow out preventer. Shallowgas. Directionaldrilling.Wellkillingprocedure.,Emergencyshutdown,Methodsof Rescue &FireFighting.

References:

1.FrankP Lees: LosspreventioninProcessIndustries-Vol.I,II&III,Butterworth-HeinemannPublishingCompany,UK.
2.ManuelofFiremanship-Vol.ItoXIII,HMSO,London.
3. FireProtectionHand book.
4.OISDguidelines.

TypeofQuestionsfor UniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

705(C)FOODANDBIOSAFETY

ModuleI

Quality attributesofoods,sizeandshape,colorandgloss, texture- visualandobjectively measurable attributes.Aromaoffoods- Introductory ideas,formationandchemistry. Introductiontosensoryevaluationoffoodsandbeverages.
Foodsafety,foodaadditivesandfoodcontaminants, theirchemical, technological and to axiological aspects, Foodlaws- developmentand enforcement. PreventionofFood AdulterationAct andFoodRegulations. ISO9000series andHACCP. CodexAlimentarius protocolsforexport.

ModuleII

Principles of food commodity storage, Insect pests - their biology and food preference. Effects ofpests onfoodcommunities.Pesticide classification andchemistry.Pesticide for emulations.Pesticide appliances.Insect growth regulators, biopesticides andgrain protestants.Fumigants, Sanitationin food processing/handlingunits. Ballooning techniquesIrradiationandotherphysicalmethodsofcontrol. Pesticideandhealthhazards. Safetydevices,pesticideresiduesinfoods,residueanalysisanddecontamination.Conceptof organicfoods.

ModuleIII

Thelegalandsocio-economicimpactsofbiotechnology-Publiceducationoftheprocesses ofbiotechnology involved ingeneratingnewforms oflifeforinformeddecision making - Biosafety regulation and national and international guidelines. R-DNAguidelines- Challenges for the Indian biotechnological research and industries - Ethical implications of biotechnologicalproductsandtechniques.

ModuleIV

Experimentalprotocolapprovals- Levelsofcontainment- Environmentalaspectsofbiotech applications-Useofgenetically modifiedorganisms andtheresistance inenvironment- SpecialproceduresforDNAbasedproductproduction- Socialandethicalimplications of biological weapons -Goodsafety practices -GLPstandards -Labcontaminants -PI,PII, PIIIguidelines.

References

1) P.K.Gupta,ElementsofBiotechnology
2) H.D.Kumar,ATextbook onBiotechnology
3)SassonA,BiotechnologiesandDevelopment
4) P.FellowsFoodProcessingTechnology:Principlesandpractice

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

705(D)FAULTDETECTIONANDDIAGNOSIS

MODULEI

IntroductiontoFaultDetectionandDiagnosis:ScopeofFDD:-TypesoffaultsanddifferenttasksofFaultDiagnosisandImplementation -DifferentapproachestoFDD:Modelfree andModelbased approaches.ClassificationofFaultandDisturbances-Differentissuesin evolved in FDD-Typical applications. Analytical Redundancy Concepts: Introduction- Mathematical representation of Fault and Disturbances:AdditiveandMultiplicativetypes- ResidualGeneration:Detection,Isolation, Computationaland stabilityproperties- Designof Residualgenerator- Residualspecificationand Implementation.

MODULEII

Design of Structured Residuals:Introduction-Residual structure of single fault Isolation:Structural and Canonical structures- Residual structure of Multiple fault Isolation: Diagonal and Full Row canonicalconcepts-Introductiontoparityequationimplementationandalternativerepresentation.

MODULEIII

DesignofDirectionalstructuredResiduals:Introduction-DirectionalSpecifications: Directional specificationwith and without disturbances -Parity Equation Implementation- Linearly dependent column.

MODULEIV

Advancedlevelissuesanddesigninevolved inFDD:IntroductionofResidualgenerationofparametricfault-RobustnessIssues-Statistically TestingofResidualgenerators-ApplicationofNeuralandFuzzylogic schemesinFDD-Casestudy.

TextBooks:

1.JanosJ.Gertler“Fault Detectionand DiagnosisinEngineering systems”-2nd Edition, MacelDekker,1998.

ReferenceBooks:

1. Sachin.C.Patwardhan,“Fault Detectionand Diagnosis inIndustrial Process” -Lecture Notes,IIT Bombay,February2005.
2.RamiS.Mangoubi,“RobustEstimationand Failure detection”.Springer-Vela-London 1998.

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

706FIREENGINEERINGLAB

1. DeterminationofflashPoint,firepointand pour point ofhydrocarbons.

2. TestsonDryChemicalPowder

   a. ApparentDensityTest
   b. HygroscopicityTest
   c. CakingTest
   d. WaterRepellencyTest e. HeatTest
   f. EfficientFluidityTest
   g. FireKnockingDownPropertyTest h. FoamCompatibilityTest

3. PerformanceTestsonPortableDCPFireExtinguishers(Cartridge Type)

4. PerformanceTestsonPortableandTrolleymountedFireExtinguishers CO_2Type.

5. TestsonFoam

   a.P Hvalue
   b. Sludgecontent
   c. SpecificGravity
   d. Miscibility
   e. FreezingPoint
   f. FilmFormationTest
   g. 25%DrainageTime
   h.Burn-backResistance
   i. FireExtinguishingProperty

6.Testofnon-combustibility of BuildingMaterials.

7. Studyoffirefightingequipmentsandaccessories.

Note:50%marksisearmarkedforcontinuousevaluation,and 50%marksforendsemester examinationtobeassessedbytwoexaminers. A candidate shallsecure minimum of 50%marks separatelyforthetwocomponentstobeelegible forapass inthatsubject.

707INDUSTRIALHYGIENELAB

1 DemonstrationandcalibrationofAirsamplingequipment

2 Samplingandestimationofgasesinworkenvironmentby aLori metricmethod

3 Samplingandestimationofsolventa pours inworkenvironment

4 Samplingandestimationofdust-gravimetric method

5 Noiselevelmeasurement-Soundlevelmeter,Octavefilterset
a)Measurement ofsoundpressurelevelindb Aanddblinear
b)Frequencyanalysisofnoise

6 Measurementofilluminationlevel

7 Studyoflungsmodels

8 Studyofoccupationaldiseaseswithphotographicmodels

9 Demonstrationofmedicallaboratoryequipments

10 Thermalstressanalysis.

Note: 50% marksisearmarkedforcontinuousevaluation,and 50%marksforendsemester examinationtobeassessedbytwoexaminers. A candidateshallsecurea minimumof 50%marks separatelyforthetwocomponentstobeelegible forapass inthatsubject.

708SEMINAR

Studentsshallindividuallyprepareandsubmitasseminary portonatopicofcurrentrelevance relatedtothefieldofSafetyandFireEngineering. Thereferenceshallincludesandjournals, conferenceproceedings,reputedmagazinesandtextbooks,technicalreportsandURLs.Eachstudents shallbevaluatedbyateamofinternalexpertscomprisingof3 teachersbasedonstyleof presentation,technicalcontent,adequacyofreferences,depthofknowledgeandoverallqualityoftheseminar report.

801HUMANFACTORSENGINEERING

MODULEI

Humanfactors- objectivesand approach.Systems thinking- human-machinesystems, characteristicsofsystems,systemreliability. Humanbeingsasinformationprocessors-informationtheory, displayinginformation,codingofinformation,characteristicsofgoodcodingsystem,compatibility, typesofcompatibility,perception,memory,decisionmaking,attention,ageandinformationprocessing, mentalworkloadanditsmeasurement.

MODULEII

Processofseeing,visualcapabilities,accommodation,visualacuity,contrastsensitivity,factors affectingvisualacuityandcontrastsensitivity,adaptation,colourdiscrimination,perception.Design ofhardcopyandVDTscreens.Graphicrepresentations-symbols,objectivesandcriteriafor selection,perceptualprinciplesofsymbolicdesign.Codes-dimension,colour.

Designofdynamicinformationdisplays,usesofdynamicinformation, designofquantitative visual displays,designofqualitativevisualdisplays,designofsignalandwarninglights,recommendations regardingsignalandwarninglights,representationaldisplays,head-updisplays.

Hearing,natureandmeasurementofsound,complexsound,anatomyofear,conversionofsound wavestossensations,masking.Auditorydisplays,detectionofsignals,relativediscriminationand absoluteidentificationoauditorysignals,soundlocalization,principlesofauditorydisplay, cutaneoussenses,tactualdisplays,substitutesforhearingandseeing,olfactorysensesanddisplays.

MODULEIII

Physicalwork-musclephysiology,workphysiology,measuresofphysiological strain,physicalworkload, workefficiency,energyconsumption,gradesofwork,factorsaffectinenergyconsumption,controlling energyexpenditure, strengthandendurance,measurementofstrength,factorsaffectingstrength.Manual materialsandling-liftingtasks,carryingtasks,pushingtasks,limitsofMMHtasks,reducingrisksof MMHoverexertion.

Motorskills - biomechanicsof human motion, types of body movements,range of movements, classesofmotormovements, Speedofmovements-reactiontime,movementtime,accuracy of movements.

Humancontrolof systems -compatibility,spatialcompatibility,movementcompatibility. Supervisorycontrol.Controlsdevices- functionsofcontrol,factorsin controldesign. Principlesofhandtoolanddevicedesign.

MODULEIV

Workplacedesign- anthropometry,staticdimensions,dynamicdimensions,principlesinthe application of anthropometricdata. Work spaces - work-space envelopes for sitting and standing personnel, out-of-reach and clearance requirements. Design of work surfaces. Science of seating - generalprinciplesofseatdesign.VDTworkstations.

Arrangementofcomponentswithinaphysicalspace -principlesofarrangingcomponents, methodlogesfor arranging components, types and uses of various data, link diagrams, general locationof various controls and displays within work space, specific arrangementsof controls and displayswithinworkspace,spacingofcontroldevices.Generalguidelines indesigning individual workplaces.

TEXTBOOK&REFERENCE

Sanders,M.M.&McCormick,E.J, HumanFactorsin Engineering&Design7thed. McGraw-HillInternationalEdition,1993.

MartinHollander,AGuidetoErgonomicsof Manufacturing, TMH, 1996.

TypeofQuestionsfor UniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

802DISASTERMANAGEMENT

MODULEI

Importanceof disastermanagementfor chemicalindustry- Typesof emergencies- majorindustrial disasters-causes and consequences of major industrial disasters like Flax borough, Savesand Bhopal. Components of a major hazard control system - identification of major hazard control installations - purposeandprocedures-safeoperationofmajorhazardinstallations-mitigationof consequences- reportingto authorities.Implementationof major hazard control systems - group of experts- training-checklists-inspection-evaluationofmajorhazards-informationtothepublic-manpowerrequirements-sourcesofInformation

MODULEII

Emergency planning - on-site and off-site emergency plan-need of plan-possible approach-objectivesofemergencyplan.

On-site emergencyplanning - formulationof the plan and emergencyservices - Identificationof resources-actionsandduties-emergency procedure-mockdrills. Off-siteemergency planning- objectivesand elementsof off-siteplan - role of administrativemachinery- role of majorhazard worksmanagement- roleof the localauthority.Emergencypreparednessatlocallevel- Awareness andpreparednessforemergenciesatlocallevel(APELL)-Theprocessanditspartners.

MODULE III

RequirementsofemergencyplanasperIndianlegislationslikeFactoriesAct,Manufacture,Storageand ImportofHazardousChemicalsRules,ChemicalAccidents(Emergency planning,Preparednessand Response)Rules.

Emergencyplanningandpreparedness ininternationalstandardslikeISO14001,OHSAS18001and OSHA'sProcess Safety ManagementSystem, EmergencyPlanningin SelvesII directive - elements ofemergencyplanninginIS:18001-HazardousMaterials/SpillsEmergencies-contingencyplans forroadtransportationofhazardouschemicals-contingencyplansforoilspillsinmarine Environment

.

MODULEIV

Natural Hazards - potentiallyhazardous natural phenomena - earthquakes- landslides- flooding - cyclones-hazardsinaridandsemi-aridareas-natureofthehazard-hazardmanagementactivities-disastermitigationnaturalhazardprediction-emergencypreparedness-disaster,rescueandrelief -postdisasterrehabilitationandreconstruction-educationandtrainingactivities-vulnerableelements tobe consideredinthedevelopmentplanningfornaturalhazardmanagement-applicationsof remotesensing andGISindisastermanagement.

REFERECES:

1.ILO,Geneva:MajorHazardControl-a PracticalManual.

2. UNEP,Paris:APELL-AProcessforrespondingtotechnologicalaccidents,AHandbook,Industry&EnvironmentOffice.1998

3. AccidentPrevention ManualforBusinessandIndustry,Vol.I-NationalSafetyCouncil, USA.

4.OilspillResponse :TheNationalContingencyPlan -InstituteofPetroleum,London

5. Petak,W.JandAtkisson,A.A.:Natural Hazard RiskAssessmentandPublicPolicy : AnticipatingtheUnexpected

6.U.R.Rao:SpaceTechnologyfor SustainableDevelopment

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

803 ADVANCED SAFETY ENGINEERING AND MANAGEMENT

ModuleI

Dominoincidentinvisitation-technique, logicdiagram, inputrequirements,output,example.
Unavailabilityanalysisofprotectivesystems-technique,logicdiagram,inputrequirements, example.
Reliabilityanalysisofautomaticcontrolsystems- PESsafetysystemdevelopmentlogicdiagram,system analysis,calculationoffractionaldeadtime,application,strengthsandweaknesses.
Introductionto MORTanalysis, IFALanalysis, MarkovprocessesandapplicationofMarkovmodeling tosafetyinstrumentedsystems,Sneakanalysis.

ModuleII

Environmentalrisk assessment- Human health risk assessment(HHRA), Ecologicalrisk assessment(ECRA), Receptor,stressorandexposure. StepsinECRA-identificationofpotentialsites, Identificationandcharacterizationofstressors identifyinreceptors, identificationofpotentialecological effects, selectionofassessmentandmeasurementendpoints,developingaconceptualmodelandrisk hypotheses,approachforriskassessment.

ModuleIII

Securityforchemicalprocessindustries- Assessmentsandregulatoryenvironment, methodsfor assessingsecurityvulnerability, emergingsecurityregulations,governmentdevelopmentand industryactivitiesthatrelateto securityforprocessfacilities. Strategiesandcountermeasures-preventionofintentionalreleasesandtheftofchemicalreleasesatprocessfacilities.
Sitesecurityforprocessindustries-Essentialelements-threatanalysis,securitycountermeasures, mitigationandemergencyresponse. Specificsecuritymeasures-informationsecurity, cyber security,physicalsecurity,policiesandprocedures,training,mitigationandresponse,inherentlysafer processes.Casestudy.

ModuleIV

SafetyManagementSystems:SHEMS,OHSAS18001andOSHA'sPSM-Policy,planning,training, implementation,managementcontrolandreview.
Layerof ProtectionAnalysis(LOPA)- Overviewof relevantstandardsand guidelines, risktolerance criteria. PreparationofLOPA-LOPAmethodology,theLOPAteam. Scenariodevelopment - components,infervently safeconsiderationInitiatingcauses/effects-identification, estimationof frequencies. Independentprotectionlayers - IPL criteria,allocationof IPL credit - basic process controlsystems,operatorresponse, pressurereliefdevice,safetyinstrumented system, safety instrumentedfunction. Safety integritylevel (SIL) assignment, InterpretingLOPA resultsand makingrecommendations.

TextBooksandReferences

1. Centrefor Chemical ProcessSafety,AICHE :Guidelinesfor ChemicalProcessQuantitativeRiskAnalysis, secondedition,2000.
2. ACC:SiteSecurityGuidelinesfortheU.SChemicalIndustry, AmericanChemistryCouncil,WashingtonDC,2001.
3. Jotter week, Ecologicalimpactassessment, BlackwellScience, 1999.

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

804(A) SAFETYINPOWERPLANTS

ModuleI

Introduction,Generationofelectricityandsourcesofenergy,Principaltypesofpowerplants.Power plantcapacity.Principlesofpowerplantdesign.
Solid, liquidand gaseousfuels,storageoffuels,Hazardsin thestorageof fuels. Safety precautionsinstorageandhandling. Combustionand combustionequipment- safetyinfurnace operations-Effectofserviceconditionsonrefectories.

ModuleII

Steamgenerator,types andsafetymeasures- Dustcollectors- Selectionofsiteforsteam plant. Layout. Thedieselengineplant:useofdieselengineinasteam plant. Advantagesand disadvantagesofdieselplants.Safetyand environmentalproblemsofdieselplants.

ModuleIII

Principleofoperationofhydroelectricpowerplants.Installationofpowerplant.Safetyduring selectionofpowerplantequipment-safety incommissioningofthermalpowerplantequipments, hydrostaticandairleakagetest, acidandalkalicleaning,safetyinauxiliaryplants.Coolingwater system.Safetyinmaintenanceofpowerplants.

ModuleIV

NuclearEnergy,Partsofanuclear reactor,Classificationofreactors,Designofnuclear reactors.Maincomponentsofanuclearpowerplant.Boilingwaterreactor,Pressurized waterreactor, Sodiumgraphitereactor,Fastbreederreactor.Light waterreactorsandHeavywater reactors.Power ofanuclearreactor.Safetymeasuresfornuclearpowerplants.
Non-conventionalsourcesofenergy.Effective utilizationofsolarenergy,Energyfromhighvelocity winds,Geothermal,Tidalandoceanthermalsourcesofenergy.

Textbooks:

1.P.K.Nag,"PowerPlantEngineering",TataMcGrawHillPublishingCo.Ltd.,1998.
2.JohnVGrimaldiandRollinHSimonds.,SafetyManagement

References:

1.S.C.AroraandS.Domkundwar,"A CourseinPowerPlant Engineering", DhanpatRaiandSons,TataMcGraw Hill,1998.
2.G.R.Nagpal,"PowerPlantEngineerig",KhannaPublishers,1998.
3.JoelWeismanandRoyEckart,"ModernPowerPlant Engineering",PrenticeHall InternationalInc,1985.

TypeofQuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

804(B) SAFETYINHEALTHCAREWASTEMANAGEMENT

ModuleI

Definition&characterizationofhealth-carewaste-sourcesandgenerationofwaste,Physicschemicalcharacteristics. Hazardsofhealth-carewaste,publichealthimpactsofhealthcare waste.

Health-care waste management planning-wastemanagement planforhealth care establishments, management of health-carewaste from scattered small sources, waste minimization,recyclingandreuse.

ModuleII

Handling, storageandtransportationofhealth-care waste -wastesegregationand Packaging, onsitecollection, transportand storage ofwaste, offsitetransportation ofwaste. Treatmentanddisposalofhealthcarewaste-Incineration chemicaldisinfection;wetanddry thermaltreatment,Microwaveirradiation,landdisposal,Initiation.

ModuleIII

Treatment and disposal methods - Infectious waste and sharps, pharmaceutical waste, cytotoxicwaste,chemicalwaste,wasteswithhighheavy-metalcontent,pressurized containers-radioactivewaste.

Collectionanddisposalof waste water-hazardsof waste waterfrom healthcare establishments-wastewatermanagement.

Workers'protection,cytotoxicsafety,Emergencyresponse.

ModuleIV

Epidemiologyofnosocomicalinfectionsandprevention.

Trainingforhealthcarepersonnel landwastemanagementoperators.

Minimal programmersfor health care waste management - waste segregation, safe recycling, treatment&disposal,managementofhazardshealth-carewastebywastecategories.

Reference:

1) APruss,E.GiroultP.Rushbrook(Ed.) : SafeManagementofWastefrom health-care activities.WorldHealthOrganization,Geneva

TypeofQuestionsfor UniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

804(C)FLUIDPOWERSAFETY

ModuleI

Introduction to Hydraulics- Pascal's Law- Conservation of energy- Pressure, Work and Power- Principles of Power Hydraulics, Pressure and Flow Measurements- Bernoulli's Principle- Hydraulicsymbols- Advantages.Hydraulicfluids,PropertiesPiping'sandSeals- Reservoirs. Actuators-Cylinders, Rams, Hydraulic Motors. Pumps- Gear, Vane and Piston types-Fixedand variableflow.Testingof Actuators&Pumps-SafetyPrecautions

ModuleII

DirectionalControl-Checkvalve,Pilot-operated,Two-way andFour-wayvalves-Rotaryvalves. PressureControl-Reliefvalves-Differentfunctions.Volumecontrol- MethodsandTypes.Testing ofControlValvesandSafetyprecautions.

ModuleIII

Pneumatic Systems: Introduction: Production of compressed air, Air Receives, Accumulators,Dry andoilfreecompressedair.
Pneumaticcontrol: Components,TypesofCylinders,ControlValves-Direction,Pressureand Flow,AirMotorsandPneumaticSymbols.
Maintenance&Safety:Compressors&Accessories.

ModuleIV

Accessories- Accumulators, PressureSwitches. Fluid Power Systems, Simple circuits- Hydraulic, Pneumatic, Hydropneumatic and Electrohydraulic. System Maintenance and Safety.

TextBooks:

1)J.Pippenger&T.Hicks : IndustrialHydraulics,McGrawHill
2)Majumdar.S.R:PneumaticSystems-Principles&Maintenance,TMH

References:

1)Ernst :OilHydraulicsanditsIndustrial Applications,McGrawHill
2)JagadishLal : HydraulicMachines
3)W.Deppert&K.Stol: PneumaticControl,VogelBuchVerlagWurzburg,1987
4)W.Deppert&K.Stol:PneumaticApplication,KemprathReiheVogelVerlag Wurzburg,1976.

Typeof QuestionsforUniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5 : TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

804(D) TOTALQUALITYMANAGEMENT

MODULEI

DefinitionofQuality,DimensionsofQuality,QualityPlanning,Qualitycosts-AnalysisTechniquesfor QualityCosts,BasicconceptsofTotalQualityManagement, HistoricalReview,PrinciplesofTQM, Leadership-Concepts,RoleofSeniorManagement, QualityCouncil,QualityStatements,Strategic Planning,DemingPhilosophy,BarrierstoTQMImplementation.

MODULEII

TQM Principles - Customer satisfaction - Customer Perception of Quality, Customer Complaints, ServiceQuality,CustomerRetention,EmployeeInvolvement-Motivation,Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement - JuanTrilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, SupplierRating,RelationshipDevelopment, Performance Measures-BasicConcepts,Strategy, PerformanceMeasure.

MODULEIII

Statisticalqualitycontrol-Theseventoolsofquality,StatisticalFundamentals-MeasuresofcentralTendency andDispersion,PopulationandSample, NormalCurve,ControlChartsforvariablesandattributes,Process capability,Conceptofsixsigma,NewsevenManagementtools.

MODULE IV

TQMtools- Benchmarking -ReasonstoBenchmark, Benchmarking Process,QualityFunction Deployment(QFD)-HouseofQuality,QFDProcess,Benefits,TaguchiQualityLossFunction,Total ProductiveMaintenance(TPM)-Concept, ImprovementNeeds.Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements, ImplementationofQualitySystem,Documentation,QualityAuditing

TEXTBOOK

1. DaleH.Besterfiled,etal., “TotalQualityManagement”, PearsonEducation,Inc.2003. (Indianreprint2004).ISBN81-297-0260-6.

REFERECES

1. JamesR.Evans&WilliamM.Lidsay, “TheManagementandControl ofQuality”,(5th Edition),South-Western(ThomsonLearning),2002(ISBN0-324-06680-5).
2. NarayanaV.andSreenivasan, N.S. “QualityManagement-ConceptsandTasks”,NewAge International1996.
3. Zeiri.“TotalQualityManagementforEngineers”,WoodHeadPublishers,1991.

TypeofQuestionsfor UniversityExamination

Q1.Eightshortanswerquestionsof5markseachwithtwoquestionsfromeachofthefour modules. Q2toQ5: TwoquestionsA&Bof15marksfromeachmodulewithoptiontoanswer either Aor B.

805PROJECT

Eachbatchofstudents(comprisingofaboutfivestudents) shallcarryout aprojectinanindustry/R&D institution/universitydepartment.

- Adetailedprojectreportintheprescribed formalshallbesubmitted attheendofthesemester.Alltestresultsandrelevantdesignandengineeringdocumentationshallbeincluded inthereport
- Theworkshallbereviewedandevaluatedperiodically

Thefinalevaluation oftheprojectshallbedonebyateamofminimum3internalexaminersincludingthe projectguide.Theevaluationshallbebasedon:

- Presentationofthe work
- Oralexamination
- Qualityandcontentoftheprojectreport

Guidelinesforevaluation:

i. Regularityandprogressofwork	60
ii.Workknowledgeandinvolvement	80
iii.Endsemesterpresentationandoralexamination	100
iv.ProjectReport-Presentationstyleandcontent	60
Total	300marks

Note:

Points(i)and(ii)tobeevaluatedbytherespectiveprojectguideandtheprojectcoordinatorbased oncontinuousevaluation.(iii)-(iv)tobeevaluatedbythefinalevaluationteamcomprisingof3internal examinersincludingtheprojectguide.

806 VIVA-VOCE

Eachstudentisrequiredtoappearforaviva-voceexaminationattheendofthecompletecoursework..The examination panel shall comprise of a minimum ofoneinternal examiner andoneexternal examiner,bothappointedbytheUniversity.Theexaminersshallevaluatethestudentsintermsoftheir conceptualgraspofthecourseofstudyandpractical/analysisisskillsinthe field.Thestudentsshallproduce theseminaretportandprojectreportsdulyattestedby theinstitutionalauthorities,beforetheexaminers