

CE/CS/EB/EC/EE/EI/IT/ME/SE 501 ENGINEERING MATHEMATICS IV

MODULE 1

Probability distributions: random variables (discrete & continuous), Probability density, mathematical expectation, mean and variance of a probability distribution, binomial distribution, Poisson approximation to the binomial distribution, uniform distribution, normal distribution.

Curve fitting: method of least squares, correlation and regression, lines of regression.

Module II

Sampling distributions: Population and samples, the sampling distribution of the mean unknown (σ known), the sampling distribution of the mean (σ) the sampling distribution of the variance, point estimation, interval estimation, tests of hypotheses, null hypotheses and significance tests, hypothesis concerning one mean, type I and type II errors, hypotheses concerning two means. The estimation of variances: Hypotheses concerning one variance – Hypotheses concerning two variances.

Module III

Finite difference Operators: ∇ , Δ , E , δ , μ , $x^{(n)}$

Newton's Forward and Backward differences interpolation polynomials, central differences, Stirlings central differences interpolation polynomial. Lagrange interpolation polynomial, divided differences, Newton's divided differences interpolation polynomial.

Numerical differentiation: Trapezoidal and Simpson's rules, compounded rules, errors of interpolation and integration formulae. Gauss quadrature formulae (No derivation for 2 point and 3 point formulae)

Module IV

Numerical solutions of ordinary differential equations: Taylor series method, Euler's method, modified Euler's method, Runge-Kutta formulae 4th order formula,

Numerical solution of boundary value problems: Methods of finite differences, finite difference methods for solving Laplace's equation in a rectangular region, finite differences methods for solving the wave equation and heat equation.

TEXT BOOKS:

Probability And Statistics For Engineers: Irvin Miller & Freund, Prentice Hall Of India
Numerical Methods: S.S.Sastry, Phi Publishers.

REFERENCES:

Numerical Methods: P.Kandaswamy.K.Thilagavathy, K.Gunavathy, S.Chand & Co.
Probability, Random Variables and Stochastic Processes A.Papoulis, Mgh Publishers

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 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

SE 502 CHEMICAL ENGINEERING III

Module I

Inorganic chemical technology

Chlor- alkali industries-soda ash-caustic soda-chlorine-hydrochloric acid. Manufacture of sulphuric acid. Phosphorous industries - phosphoric acid-wet process phosphoric acid, electric furnace phosphoric acid, single super phosphate and triple super phosphate. Nitrogenous industries- ammonia, nitric acid, urea, ammonium sulphate, ammonium phosphate.

(Only the processes currently in use in industries need be covered)

Module II

Organic chemical technology

Manufacturing processes for pulp and paper, sugar, industrial alcohol by fermentation-absolute alcohol, beers, wines, oils and fats, soaps and detergents, agrochemicals, introduction to polymers, synthetic rubbers- SBR, neoprene, urethane rubbers.

(Only the processes currently in use in industries need be covered)

Module III

Bioprocess engineering

An overview of traditional and modern applications of biotechnological processes, outline of an integrated bioprocess and the various (upstream and downstream) unit operations involved in bioprocesses, general requirements of fermentation processes, types of fermentors and bioreactors, auxiliary instrumentation of bioreactors, main parameters to be monitored and controlled in fermentation processes, Enzymes – mechanism of enzyme action, introduction to enzyme kinetics, Michaelis – Menten kinetics, methods of enzyme immobilization.

Module IV

Chemical plant design and economics

Process design development – types of designs, feasibility survey, preliminary design, flow diagrams, piping and instrumentation diagram, batch versus continuous operation, factors in equipment scale up and design, equipment specifications. General design considerations – plant location, selection of plant site, plant layout. Detailed engineering – mechanical, structural, electrical and instrument designs. Capital cost estimates – fixed and working capital, cost escalation, cost indexes, estimating equipment costs by scaling. Selection of materials for chemical plant construction under ordinary temperature and pressure and high temperature and pressure conditions.

Text Books

1. M. Gopal Rao & M. Sittig (Eds), *Dryden's Outlines of Chemical Technology*, Affiliated East West Press
2. Michael L. Shuler and Fikret Kargi, *Bioprocess Engineering: Basic Concepts*, Prentice-Hall of India, 2002.

Reference Books

1. Max S. Peters and Klaus D. Timmerhaus, *Plant Design and Economics for Chemical Engineers*, McGraw-Hill Book Company, 2004.
2. G.T. Austin (Ed), *Shreve's Chemical Process Industries*, McGraw Hill Book Company

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 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

SE 503 PRINCIPLES OF ENGINEERING DESIGN

MODULE 1

Introduction to design- steps in design- design factors- practical considerations in design- theories of failure- stress concentration - consideration of creep and thermal stress in design.

Detachable joints- design of screws- thread standards- thread stress- pre-loading of bolts- external load with pre-load -fatigue and shock loading- Types of keys- types of pins- design of cotter and pin joint.

MODULE 2

Riveted Joints-stresses in riveted joints- design of riveted joints subjected to central & eccentric loads- boiler and tank joints - structural joints.

Welded joints-types of welded joints- design of welded joints subjected to axial, torsion and bending loads.

MODULE 3

Springs- stresses in helical spring- deflection of helical compression and extension Spring- springs subjected to fatigue loading- concentric and helical torsion spring - critical frequency of springs- leaf springs- design of automotive leaf springs.

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

MODULE 4

Design of cylindrical and spherical vessels for internal and external pressures- design of heads and enclosures- tall vessels- supports for vessels- non standard flanges- pipeline design. Design of storage tanks.

REFERENCE

1. Joseph Edward Shingley, *Mechanical Engineering Design*
2. V.I. Doughite, *Design of Machine elements*
3. J. Myatt , *Machine Design*
4. L.E. Brownell and B.H. Young, *Process Equipment Design*
5. M.V. Joshi, *Process Equipment Design*,
6. IS 2825:1969 - Code for unfired pressure vessels (**to be permitted for examination**)
7. Design Data Books (**to be permitted for examination**)
 - 1 Prof. B.R. Narayana lyengar & Dr. K. Lingaiah
 - 2 PSG Tech.
 - 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.
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SE 504 FIRE ENGINEERING - II

MODULE I

Effect of temperature on the properties of structural materials- concrete, steel, masonry and wood; Behaviour of non-structural materials on fire- plastics, glass, textile fibers and other house hold materials; Determination of combustibility by fire tube method; Brief description on non-combustibility test and classification of flame spread rate of materials as per relevant standards (BIS). Compartment fire-factors controlling fire severity, ventilation controlled and fuel controlled fires; Spread of fire in rooms, within building and between buildings..

MODULE 2

Experimental determination of fire resistance – types of furnaces; Approximate methods for 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 calculation of the fire resistance limits of structures-coefficient of fire resistance, fire duration; Approximate calculation of the required fire resistance for a building.

MODULE 3

Fire area- calculation of building fire area, subdivision of fire areas in Industrial, Residential and Public buildings; Fire separation between building-principle of calculation of safe distance. Design principles of fire resistant walls and ceilings; Fire resistant screens-solid screens and water curtains; Local barriers; Fire stopped areas-in roof, in fire areas and in connecting structures; Fire doors- Low combustible, Non combustible and Spark-proof doors; suspension of doors; Air-tight sealing of doors; Specification, test and performance criteria of Plate, Metal covered and Rolling type fire doors as per relevant standards (ISI).

MODULE 4

Fabricated fire proof boards-calcium silicate, Gypsum, Vermiculite, and Perlite boards; Fire protection of structural elements – Wooden, Steel, RCC, and Plastic structures; Reparability of fire damaged structures- Assessment of fire severity, Assessment of damage to concrete, steel, masonry and timber structures, Assessment of feasibility of repair; Repair techniques-repair methods to reinforced concrete Columns, beams and slabs, Repair to steel structural members, Repair to masonry structures.

Text Books

1. Roytman M. Ya., “Principles of Fire Safety Standards for Building Construction”, Amerind Publishing Co. Pvt. Ltd., New Delhi, 1975
2. Smith E.E. and Harmathy T.Z.(Editors), “Design of Buildings for fire safety”, ASTM Special Publication 685, American Society for Testing and Materials, Boston, U.S.A., 1979.
3. E.Gorden Butcher E. G. and Parnell A. C., “Designing of fire safety”, John Wiley and Sons Ltd., New York, U.S.A., 1983

Reference Books

1. Marchant E.W., “A Complete Guide to Fire and Building”,
2. Adam and Charles Black, “Fire safety in Buildings”,
3. HMSO, “Fire protection in factory building”,
4. BIS, “IS-12777- Fire safety-flame-spread of products- Method for classification, Bureau of Indian Standards, New Delhi, 1989.
5. BIS, “IS 3614 (Part-1) – Specification of fire check doors-part 1: Plate, metal covered and rolling type” Bureau of Indian Standards, New Delhi, 1966.
6. BIS, “IS 3614 (Part-2) – Specification of metallic and non-metallic fire check doors-part 2: Resistance test and performance criteria, Bureau of Indian Standards, New Delhi, 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.
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SE 505 PRINCIPLES OF INDUSTRIAL MANAGEMENT

MODULE I

Organisation : Concept of organisation, characteristics of organisation, elements of organisation, organisational structure, *organisation* charts, Types of organisation- line & staff organization, functional organisation, project organisation, matrix organisation,
Management: Functions, Evolution of management theory, Principles of scientific management,

MODULE II

Personnel Management: Motivation theories, Leadership theories and models, Recruitment and training, labour turnover, operator training,
Wages and Incentives: feature of wages, time and piece rate, incentive plans, profit sharing. Job evaluation , Merit rating methods- factors of comparison and point rating-defects.
Industrial Relations: industrial disputes, collective bargaining, trade unions, workers' participation in management, labour welfare.

MODULE III

Production Management: Production System-Functions-Product Design-Product Life Cycle. Demand forecasting for operations - components of demand - methods of prediction and forecasting - forecasting models – casual & time series PPC-Functions -Models
Capacity Planning - Evaluating future capacity - capacity requirement –Aggregate Planning
Inventory Control-Objectives-Costs-Models : Basic, Production, Shortage-ABC Analysis.

MODULE IV

Project Management: Project Appraisal - Feasibility Analysis, Market feasibility, Technical feasibility, Financial feasibility, Economic feasibility, Financial and Economic appraisal of a project, Social Cost- Benefit Analysis in India, Project Report.
Project Scheduling : Network Techniques, PERT , CPM ,GANTT charts , GERT , Time cost trade off and crashing procedure

References :

1. Buffa, E.S., *Modern Production and Operations Management*, 7th edn., John Wiley and Sons, 1983.
2. Prasanna Chandra., *Projects Planning, Analysis, Selection, Implementation & Review*, 4th edn..Tata Mcgraw Hill ,New Delhi,1995.
3. Kootnz and Donnel., *Principles of Industrial Management*
4. Martand Telsang, *Industrial Engineering and Production management*. 2nd edn. ,S.Chand & Co., New Delhi

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
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SE 506 SAFETY IN CONSTRUCTION

MODULE- I

Introduction to Construction Industry- Safety issues in construction - Human factors in construction safety management. Roles of various groups in ensuring safety in construction industry. Framing Contract conditions on safety, and related matters. Relevance of ergonomics in construction safety.

MODULE- II

Safety in various construction operations- Excavation- under- water works- under-pinning & shoring- Ladders & Scaffolds- Tunneling- Blasting- Demolition- Pneumatic caissons- confined Space- Temporary Structures. Indian Standards on construction safety- National Building Code Provisions on construction safety.

MODULE- III

Safety in material handling and equipments- Safety in storage & stacking of construction materials. Safety in the use of construction equipments- Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pulley blocks, Mixers, Conveyors, Pneumatic and hydraulic tools in construction. Temporary power supply.

MODULE- IV

Contract Labour(R&A) Act and Central Rules: Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties, Rules regarding wages.

Building & Other Construction Workers (RE & CS) Act, 1996 and Central Rules, 1998: Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, General Safety, Health & Welfare provisions, Penalties.

References:

1. K.N. Vaid, *Construction Safety Management* .
2. V.J. Davies and K. Tomasin, *Construction Safety Handbook*.
3. James B. Fullman, *Construction Safety, Security & Loss Prevention*
4. Linger L, *Modern Methods of Material Handling*
5. R.T. Ratay, *Handbook of Temporary Structures in Construction* .
6. National Building Code of India
7. Relevant Indian Standards published by BIS
8. Contract Labour Act and Central Rules
9. Building & Other Construction Workers (RE &CS) Act, 1996 and Central Rules.

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 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

SE 507 SAFETY ENGINEERING LAB

1. Study of PPE's.
2. Assessment of the safety performance in an industry and preparation of report..
3. Accident investigation and Analysis – Exercises
4. Job safety analysis – Exercises
5. Safety survey of a laboratory.
6. Safety audit of a laboratory.
7. Calculation of cost of accidents.
8. Preparation of work permits.
9. Safety assessment in a construction site.
10. Design and development of a training module on any topic of safety.
11. Preparation of a P & I diagram using AutoCad.
12. Preparation of the layout of a chemical plant using AutoCad.

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

SE 508 CHEMICAL ENGINEERING LAB

1. Sieve Analysis – To analyse a given sample using a set of standard sieves and thus to determine the specific surface area, the volume surface mean diameter and the mass mean diameter by differential analysis and cumulative analysis.
2. Study of the working of Plate and frame filter press.
3. Free settling – To find out the drag coefficient of a falling sphere in a fluid and verification of Stoke's law.
4. Sedimentation – To study batch sedimentation of a slurry and to determine the area of the continuous thickener.
5. Heat transfer from steam to air – Determination of overall heat transfer coefficient.
6. Verification of material balance equation and Rayleigh's equation for simple distillation.
7. Steam distillation.
8. Leaching – leaching a mixture of salt and sand.
9. Study of the kinetics of chemical reaction in a batch reactor.
10. Adsorption isotherms.
11. Frequency response of first and second order systems.

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