

3MI2-01: Advanced Engineering Mathematics-I

Credit : 3	Max. Marks: 150(IA:30, ETE:120)
3L+-T+0P	End Term Exam : 3 Hours

Contents

Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Numerical solution of ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predictor-corrector methods.

Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method.

Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method.

Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem, application of Fourier transforms to partial ordinary differential equation (One dimensional heat and wave equations only).

Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation.

3MI1-02/4MI1-02 : Technical Communication

Credit : 2	Max. Marks: 100(IA:20, ETE:80)
2L+-T+0P	End Term Exam : 2 Hours

Contents
Vocabulary Building. Concept of Word Formation. Affixes. Synonyms and Antonyms.
Grammar Words and Sentences. Verbs and Tenses. Questions and Question Tags. The Infinitive and the ‘...ing’ form.
Grammar Nouns and Articles. Determiners. Adjectives and Adverbs. Relative clauses.
Identifying Common Errors in Writing Subject- Verb Agreement. Noun-Pronoun Agreement. Articles. Prepositions.
Composition Précis Writing. Essay Writing. Comprehension of Passage.

3Mi1-03/4Mi1-03 : Managerial Economics and Financial Accounting Course

Credit : 2	Max. Marks: 100(IA:20, ETE:80)
2L+-T+0P	End Term Exam : 2 Hours

Contents
<p>Basic economic concepts- Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.</p>
<p>Demand and Supply analysis- Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.</p>
<p>Production and Cost analysis- Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.</p>
<p>Market structure and pricing theory- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.</p>
<p>Financial statement analysis- Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.</p>

3MI3-04 : Strength of Material

Credit : 2	Max. Marks: 100(IA:20, ETE:80)
2L+-T+OP	End Term Exam : 2 Hours

Contents

Fundamentals: Stress and strain, engineering properties, Saint-Venant's Principle. Stress strain diagram's mechanical properties of materials, elasticity and plasticity. Shear stress and strain, pure shear, Complementary shear. Linear elasticity and Hooke's law. Poisson's ratio, volumetric strain, bulk modulus of elasticity. Elastic constants and relation between elastic moduli. Stress and strain in axially loaded members. Temperature stresses and effects.

Beam under Flexural Loads : Beams – types and transverse loading on beams, Bending moment and shear force, relation between load, Shear force and bending moment.

Bending moment and shear force diagrams for simply supported, Cantilever and overhang beams under static loading of different types viz. point loads, Uniformly distributed loads, linearly varying loads, Pure bending. Theory of simple bending of initially straight beams. Flexural stresses in beams. Built up and composite beams. Shear stresses in beams of rectangular, Circular and I-section. Shear formula, effect of shear strain.

Deflection of Beams: Double Integration method – Macaulay's method. Area moment theorems for computation of slopes and deflections in beams – Conjugate beam method

Torsion: Torsion of solid and hollow circular shafts. Stresses and deformation in circular and hollow shafts – Stepped shafts- shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs.

Columns: Buckling and stability, critical load. Euler's theory for initially straight column with different end conditions, equivalent length, Limitation of Euler's formula. Rankine's formula. column under concentric loading. Secant, Perry's and Indian standard Formulas

Energy Principles: Strain energy and strain energy density – Strain energy due to axial loads, shear, flexure and torsion – Castigliano's and Engesser's energy theorems. Principle of virtual work – Application of energy theorems for computing deflection in beams – Maxwell's reciprocal theorems.

3MI4-05: Mechanical Engineering

Credit : 2	Max. Marks: 100(IA:20, ETE:80)
2L+-T+0P	End Term Exam : 2 Hours
Contents	
<p>Thermodynamics: Thermodynamic properties, closed and open systems, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of First Law in heating and expansion of gases in non-flow processes. First Law applied to steady flow processes. Second law of thermodynamics: Kelvin-Planck and Clausius statements. Reversible processes, Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamic processes. Steam Boilers: High pressure boilers of natural and forced circulation type, La Mont, Benson, Loeffler, Velox Boilers. Steam Turbines: Expansion of steam through nozzles with and without friction. Throat pressure for maximum discharge. Working of impulse and reaction turbines. Compounding. Velocity diagrams. Governing of turbines. Emergency governing. Condensers: Types, classification and details. Vacuum efficiency. Cooling towers and spray ponds. Gas Turbines: Basic principles, Simple gas turbine cycle, application of Gas turbine</p> <p>Internal Combustion Engines: Introduction. Classification, terminology and description of IC Engines. Four stroke and two stroke petrol, gas and diesel engines. Valve timing diagrams. Comparison of petrol and diesel engines. Simple carburettor. Ignition system of SI engine, diesel fuel pump and injectors. Governing of IC engines. Starting of engines. Measurement of IP, BP and heat balance calculations (not involving combustion). Engine efficiencies and performance</p> <p>Transmission of Power: Belts, ropes and chains, tension in belts, power transmitted by belts. Gears and Gear trains. Brakes and Dynamometers: Band brake, block, band and block brake. Single and multiple disc clutches. Transmission and absorption type dynamometers.</p> <p>Vibrations: Free, longitudinal, transverse and torsional vibrations, Critical speed.</p> <p>Bearings and Couplings: Main types of bearings and coupling. Antifriction bearings.</p> <p>Lubrication: Laws of friction for dry and lubricated surfaces, Methods of lubrication of bearings.</p> <p>Refrigeration: Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P. Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle,. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).</p> <p>Refrigerants: Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants</p> <p>Air Conditioning: Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Introduction to comfort air conditioning.</p>	

3MI4-06 : Elements of Mining

Credit : 3	Max. Marks: 150(IA:30, ETE:120)
2L+-T+0P	End Term Exam : 3 Hours

Contents

Mineral resources of Rajasthan, India and World; Mining of important economic minerals in India;

Various terms used in mining; Stages in the life of the mine,

Introduction to unit operations, Economical, Social, Environmental and Health impacts of Mining.

Prospecting: Reconnaissance; principles and methods of prospecting - pit, shaft, trench and boreholes; Principle, method, Work schedule and application of Geologic, Geophysical, Geochemical, Electrical, Electromagnetic, Gravity methods of prospecting,

Sampling techniques; planning a prospecting programme Application of Remote Sensing and GIS in mineral prospecting.

Exploration: Boring, Principles of boring, Selection of sites for boreholes; Surface layout of boring; Details of equipment, Core recovery, Borehole logging; Maintenance of records; Deflection of boreholes; Difficulties in boring; Fishing tools and their uses; Methods of exploratory drilling for oil; Interpretation of borehole data

Explosives: Classification and comparative properties of explosive; Modern explosives, Mechanisms of rock blasting; Blasting devices; Electric and non - electric methods; Delay blasting techniques; Priming; Charge distribution; Blasting with cut and solid blasting, General application and uses; Safety considerations.

Pre mining, mining and post-mining: ancillary mining operation, Types of entries to mineral deposits – Shaft, Incline, Adit –applicable conditions-limitations. Basic concepts of surface and underground mining, Comparison of underground and surface mining

3MI4-07 : Mine Machinery – I

Credit : 2	Max. Marks: 100(IA:20, ETE:80)
2L+-T+0P	End Term Exam : 2 Hours

Contents
<p>Compressed Air: Air Compressors; types, construction, installation & maintenance; Transmission and distribution of compressed air; Calculations of main parameters; Comparison of compressed air with other forms of power</p> <p>Wire ropes: Usage, chemical composition, infield tests of wire, classification of wire ropes, Wire ropes used in mines- their applicability, construction, installation, maintenance, causes of deterioration, precautions, selection parameters, Various tests, computation of numerical problems on size - Weight and strength of wire ropes, space factor, Capping and recapping of wire ropes, classification - description of capping methods - splicing methods, description of splicing and change of ropes.</p> <p>Aerial Ropeway: Different types, their suitability, advantages, limitations, construction, installation, operation and maintenance, layouts and working of terminal, loading, unloading, change over, turning station, rope tensioning arrangements.</p> <p>Rail Transportation: Purpose of transportation, comprehensive classification of transportation – Various haulage systems, their applications, merits, and demerits, safety devices in haulage system, laying and maintenance of track, gauge selection, constructional details of mine tub/car, factors of selection for rope/loco haulage, computation problems for determination of loco parameters, rope haulage engine H.P. rope size, breaking strength, tub capacity, number of tubs.</p> <p>Conveyor haulage: Conveyor usage, different types and applicability, their construction, installation and maintenance, belt conveyor system, different types of belt constructions, safety devices merits, demerits and limitations of Belt conveying system, belt tensioning arrangements, sequentially controlled conveyors, compilation of numerical problems to find the material quantity, H.P., length and inclination of haulage, tensing strength, breaking strength of belt, amount of slip etc.</p>

3MI4-08 : Mining Geology – I

Credit : 3	Max. Marks: 150(IA:30, ETE:120)
3L+-T+0P	End Term Exam : 3 Hours

Contents

Introduction and importance of geology in Mining: Evolution , age , origin and interior of the earth; Physio-graphic features of India ; Geological Time Scale; Exogeneous and endogeneous processes; Metallogenesis.

Physical geology: Geological processes- weathering, erosion, transportation and deposition; Geological work done by wind, river, lake, glacier, underground water and sea;

Mineralogy: Definition of mineral, identification by physical, chemical and optical properties; Polymorphism and isomorphism; Crystallography and its definition; Crystal systems in brief; Classification of rock forming minerals; Description of mineral families. i.e. feldspar group, mica group, pyroxene group, amphibole group.

Petrology: Definition of rock, formation, crystallization, texture, structure and classification of igneous rocks; Definition of sedimentary rocks, formation, texture, structure and classification; Definition of metamorphic rock, metamorphism, agents responsible for metamorphism, texture, structure and classification.

Diastrophism ; Slow and rapid earth movements; Earthquakes causes and effects; Seismic belts, Interior of earth; Volcanoes: products and distribution; Mountains: types, mountain building, and plate tectonics.

3MI4-21 : Mechanical Engineering

Credit : 1.5	Max. Marks: 75 (IA:45, ETE:20)
OL+-T+3P	End Term Exam : 3 Hours

Contents
<ol style="list-style-type: none">1. Study of steam engine, boilers2. Dryness fraction measurement3. Study of IC engines4. Study of simple carburettors5. Determining valve timing diagrams6. Engine testing7. Study of various transmission systems8. Gearing ratio and no. of teeth on gear9. Study of gears, brakes and dynamometers10. Study of various types of clutches and antifriction bearings11. Refrigeration cycle12. Study and experiments on refrigeration systems13. Study of air conditioner14. Refrigeration and Air Conditioning in Mines

3MI4-22 : Elements of Mining

Credit : 1.5	Max. Marks: 75 (IA:45, ETE:20)
OL+-T+3P	End Term Exam : 3 Hours

Contents
<ol style="list-style-type: none">1. Mapping of different mineral resources of (i) Rajasthan (ii) India and (iii) world.2. Illustration of Mining Terminology3. Various types of fishing tools used in exploratory boring for mineral and oil4. Bore-hole logging and interpretation of bore hole data and numerical problems related to it5. Designing of explosive magazine6. Preparation of prospecting scheme7. Study of portable borehole machine8. Study of various types of bits used in borehole coring9. To feed the bore hole data in computer software and to take results related with the formation and quantum of mineral resources10. Selection of various types of blasting accessories used in mines11. PMS Plants with various capacities for surface mines12. SMS Plants with various capacities for surface mines13. Preparation of series and parallel blasting circuit connections14. Study of portable magazine15. Study of exploder

3MI4-23 : Mine Machinery – I

Credit : 1.5	Max. Marks: 75 (IA:45, ETE:20)
OL+-T+3P	End Term Exam : 3 Hours

Contents

1. Transmission and distribution of compressed air for surface and underground mines with pressure losses and remedial measures
2. Wire ropes construction and determination of space factor
3. Rope splicing
4. Different types of rope capels and method of recapping
5. Design and application of rope capels
6. Various stations in aerial rope way e.g. Loading, Unloading, Transfer, Turning, Terminal stations
7. Laying of tracks and different crossings
8. Safety devices used on haulage system
9. Battery charging station
10. Loco garage
11. Conveyor systems
12. High angled conveyor
13. Belt tensioning arrangement and Loop take up arrangements
14. Sequentially controlled belt conveyor system

3MI4-24 : Mining Geology – I

Credit : 1.5	Max. Marks: 75 (IA:45, ETE:20)
OL+-T+3P	End Term Exam : 3 Hours

Contents of the Subject

1. Minerals under handspecimen.
2. Rocks under handspecimen.
3. Geomorphic models.
4. Crystal models under handspecimen.
5. Geological Time-Scale.
6. Geological succession of India and available minerals.
7. Geological succession of Rajasthan and available minerals.
8. Geologic maps and sections.
9. Plotting Indian geological formations & mineral deposits.
10. Plotting of earthquake/ seismic belts of world.
11. Plotting of earthquake/ seismic belts of India
12. Plotting of volcanic belts of World
13. Plotting of volcanic belts of India
14. Plotting of Physiographic maps of India
15. Plotting of structure/ tectonic map of India