

वीर बहादुर सिंह पूर्वान्वल विश्वविद्यालय , जौनपुर

प्रेषक—

परीक्षा नियंत्रक
वीर बहादुर सिंह पूर्वान्वल विश्वविद्यालय,
जौनपुर



पत्रांक 9327/सा10प्रशा./2022

दिनांक :

अधिसूचना

एतद्वारा सर्वसम्बन्धित को सूचित किया जाता है कि Renewable Energy, M.H.R.D., Business Economics, MBA, Mathematics, Computer science and Engineering, and Biotechnology विषयों में सहायक आचार्य पद पर चयन हेतु परीक्षा दिनांक-25.08.2022 दिन बृहस्पतिवार को विश्वविद्यालय परिसर में आयोजित की जाएगी।

अर्ह अभ्यर्थियों को प्रवेश पत्र यथाशीघ्र निर्गत किए जायेंगे। उक्त विषयों के सहायक आचार्य पद की परीक्षा हेतु पाठ्यक्रम विश्वविद्यालय की वेबसाइट-www.vbspu.ac.in पर अपलोड कर दिया गया है।

परीक्षा नियंत्रक

प्रतिलिपि-निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. वित्त अधिकारी / कुलसचिव जी।
2. निजी सहायक कुलपति, मा10 कुलपति महोदया के संज्ञानार्थ।
3. समन्वयक, आई.क्यू.ए.सी. सेल।
4. प्रभारी, वेबमास्टर को इस आशय से प्रेषित कि उक्त सूचना को विश्वविद्यालय की वेबसाइट पर अपलोड करने का कष्ट करें।
5. मीडिया प्रभारी, विश्वविद्यालय परिसर को इस आशय से प्रेषित कि उक्त सूचना को विभिन्न समाचार पत्रों में निःशुल्क प्रकाशित कराने का कष्ट करें।

परीक्षा नियंत्रक



Syllabus: Centre for Renewable Energy

General Aptitude

Fundamentals of Materials Properties: Mechanical Properties, Chemical Properties, Electrical Properties, Thermal properties, Magnetic properties, optical properties; Thermal Expansion, Electrical Conductivity, Free electron gas & Ideal gas, Debye model, Maxwell Boltzmann Statistics, Fermi-Dirac Statistics, Anisotropy, Periodic potential, confinement and quantization, Density of state, Reciprocal space, properties of materials at nano scale, photovoltaic materials and device characteristics, Thermoelectric materials and device characteristics, synthesis techniques of nanoscale materials, thin films and growth techniques; Fundamentals of material characterization: XRD, SEM, TEM, UV-Vis, Raman, Photoluminescence, Fluorescence and SIMS spectroscopy

Syllabus

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M. H.R.D.

UNIT-01

Concept of HRD, Features, Function
Designing HRD Mechanism/Subsystem
HRD Training , Induction & Potential Appraisal Strategies

UNIT- 02

Performance appraisal , HRD Performance through KRA, task Target, Self appraisal
Performance Appraisal by Supervisors , Performance Review and counseling Appraisal
practices in India.

UNIT-03

Potential Appraisal Method , Potential Development
Job Rotation
Career Development , Career Paths , Career Counseling , Career Information , Career Planning

UNIT-04

Role Responsibilities of HRD Managers and Chief Executive , Assessing HRD Effectiveness
Emerging issues and Challenges for HRD Professionals.

UNIT- 05

HRD Practices at present, Recruitment , Selection , Industrial Development , Industrial
Psychology, TQM ,Human Resource Accounting, HR Economics , Leadership, Communication
all relevant and emerging issues of HRM/HRD/Personnel Management.

Syllabus

3

Business Economics

- Management Concept & Function
- Business Environment.
- Organizational Behavior & Human Resource Management
- Organizational Development & International Human Resource Management.
- Accounting and Auditing, Financial Management, Capital Budgeting,
- Income-tax and Corporate Tax Planning
- Strategic Management
- Economics, Growth and Development Economics , Environmental Economics, Indian Economy.
- International Economics, Public Finance, Money and Banking, Financial Institutions.
- Statistics ,Demography and Econometrics.
- Research Methods, Operations Research
- Banking and
- Marketing Management, Advertising ,Branding, Consumer Behavior, CRM, Services Marketing, International Marketing
- Logistics.
- Business Law
- International Business & Finance, Capital Market
- Entrepreneurship

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MBA

MANAGEMENT & FUNDAMENTAL SUBJECTS

Management, managerial functions and roles, evolution of management thoughts, Contributions of FW Taylor, Henry Fayol, Elton Mayo and other management thinkers. Decision making, Planning, Management By Objectives (MBO). Nature, structure and process of organizing, span of management, different methods of departmentation, line/staff. Behavioral models, motivation, and leadership; concept, theories and approaches. The control process, Budget and non-budgetary control techniques, emerging issues in management; culture and multi-culturalism, competitiveness, teamwork. Current affairs in business and economy.

Concept of Organization, Organization behaviour, determinants and models. Perception, perceptual errors, values systems spruces and attitude formation. Personality: Types & theories; Motivation: process and theories; Learning: process and theories. Group Dynamics, Formal structural framework of group cohesiveness, conflict management & resolution techniques. Management of change and OD: Meaning & intervention.

Business Environment, Micro and Macro environment, Environment scanning and diagnosing, Technique of environmental analysis. Constitutional provisions relating to trade and industry, EXIM policy, FEMA, Environment Protection Act, and Consumer Protection Act, Industrial policy reforms in India; Five years plan and Planning Commission. Economic environment, Monetary and fiscal policy, Salient feature of new industry policy, public sector undertaking and privatization, Liberalization and India, WTO/ GAT and its impact on Indian Business. Technology-Society interface, social responsibility of business, emerging trends towards corporate accountability to social development, Environment Management and ISO 14000. Human values and Management, Indian insights, Holistic approach for managers in decision-making, spiritual values in management.

Managerial economics, scope, micro economics & macro economics, basic economic tools in managerial economics. Utility analysis, TU & MU, law of diminishing marginal utility, law of equi-marginal utility – assumptions of the law, law of proportionality, Consumers goods & producers goods, complement of waste management & Resource Management, Wastivity & Productivity. Demand, types of demand, change in demand, the law of demand – assumptions of the law, demand curve, elasticity of demand, flux or percentage method, point or geometric method, techniques of demand forecasting, input – output analysis. Production function, function types (Fixed, variable, Cobb Douglas, linear homogenous), Law of returns – law of diminishing returns assumptions of the law, law of constant returns, returns to scale, cost analysis, Marginal cost, TC & MC, long run cost analysis – Diminution of LAC & LMC, LMC & SMC, Revenue concepts & revenue analysis.

Theory of Pricing: Price Determination under perfect competition, pure competition and perfect competition, Monopoly, Price determination under monopoly, elements of time in price determination, Monopolistic Competition, Duopoly and Oligopoly: Meaning and main features, price determination of a firm, (monopolistic competition), non-price competition, product differentiation and pricing diversity.

Business Policy and Strategic Management, Strategic Decision Making, Board of directors, CEOs and Top management in the strategic management, corporate governance, Mission and objectives. Constituents of External Environment, Environmental analysis, Competition analysis, Preparation of ETOP. Internal corporate analysis, SWOT, Models to analyse strength & weakness. Formulation of strategy, Tows Matrix, Grand strategies, Growth, Stability, Retrenchment & Combination strategy, Genetic competitive strategies. Portfolio Analysis, BCG Model, GE-Nine Cell Model, Corporate parenting. Strategy Implementation Process, Leadership Implementation, Behavioral Issues in strategy Implementation. Functional strategy: Marketing, Operations, Finance, Recent R & D & HR strategies, Diversification, Integration, Mergers and Acquisitions (M & A), RE-engineering and Restructuring.

Entrepreneur, types, traits and functions. Entrepreneurship; theories of entrepreneurship, Drucker, Schumpeter & Walker's view of entrepreneur, Economic, sociological & psychological theories of entrepreneurial origin, entrepreneurs Vs. Managers, entrepreneurs Vs. Entrepreneurship. Establishing Entrepreneurial system: Search for business idea, preparation of feasibility report, legal formalities & documentation. Planning and EDP, Govt. Policy towards SSIs. Institutional set up assisting entrepreneurship: DIC and Industrial estate, NSIC, NPC, STEP & commercial banks, Women Entrepreneurship, Rural Entrepreneurship, Intrapreneurs.

Research, Significance, Approach to research methods, Research Methodology. Research problem and Research Design: Meaning, component, and types of design, formulation of research problem hypothesis: Meaning, function, types, forms of hypothesis. Primary and Secondary data, Sampling and sampling technique. Classification and Analysis of data, Statistical tools, Measures of central tendency, correlation, regression, testing of hypothesis, T-Test, Chi-square test. Report writing, Application of research in management, marketing and personnel research. Communication, Barriers and Gateways in Communication, Communication Networks, Business Communication. Verbal Communication, Oration, Public Speaking & Dyadic Communication, Presentation and Delivery, Preparing for Meeting & Interviews. Telephonic Communication and Negotiation. Written Communication: Job Applications, Resumes. Interdepartmental Communication, Business Letter Writing, Memos & Orders, Communicating Through E-Mail, Do's & Don't's of Business Writing. Case Study and Exercises for Developing Communication and Decision-Making Skills.

Computer application, Hardware, Software, Languages of computer, Operating system. MS-Word, MS-Excel. Rearranging work sheets. Excel formatting. Wrapping text. Working with graphics. Power Point, Creating presentation. Working with text, Show Time. MS-ACCESS (Data Base Managing System): Preparation of database. Finding Sorting and Displaying Data: Queries and Dynasts. Manual reporting.

Management Information System (MIS), components of an information system. Developing an I.S: Feasibility studies, system analysis, system design, prototyping, implementing and maintenance of a new information system. Applications of Information System. Data Base Management Systems, Data Warehousing and Data Mining, Information Security. Decision support system, executive support system, Artificial intelligence (AI), Expert systems, Neural Networks.

MARKETING MANAGEMENT

Marketing, Core marketing concepts, the marketing environment, customer satisfaction, value and retention. Marketing research and marketing information system, understanding consumer and industrial buying behavior, STP. Product decisions, product mix, new product development and product life cycle, branding and packaging decisions. Pricing methods and strategies, promotion mix, channel management decisions, retailing, whole-selling and market logistics. Organising and implementing marketing in the organization.

Advertising & its role in marketing, ethics & social issue in advertising. Advertising planning & decision-making, Adverting message and communication process. Adverting Budget decision, media decisions, media factors, media class, media vehicles, media options scheduling & timing. Sales Management, AIDAS theory of selling, types of personal selling, sales organization. Sales meetings, Sales contests, Sales quotas, Sales budget, purpose, budgetary procedure, Sales audit, Sales analysis.

Understanding Brands – Brand Hierarchy, Brand Personality, Brand Image, Brand Identity, Brand Positioning, Brand Equity, Brand – Customer Relationships, Brand Loyalty and Customer Loyalty, Managing Brands: Brand Creation, Brand Extensions, Brand portfolio, Brand assessment through research, Brand Identity, Position, Image, Personality Assessment and Change, Brand Revitalization,

Emergence of service economy, goods vs services marketing, Marketing challenges in service Businesses, Service Classification. Service product management, Service encounter, The service consumer behaviour, quality issues in services. Advertising, Branding and Packaging of services, Recovery Management and Relationship Marketing, Service Marketing, marketing of financial services.

Strategic Management Interface; Strategic Marketing Orientation, Strategic Marketing Planning and Strategy Formulation – Situation Analysis, Planning Gap Determination, Strategy Search, Contingency Planning and Evaluation; Components of Marketing Strategy. Competitive (Rival Oriented) Strategies; Determination and Selection of Strategies. Marketing Intelligence; MIS, DSS and Competitive Intelligence (CI); Strategic Approach to Design Marketing Mix. Implementation and Organisation for Strategic Marketing.

International Marketing, Domestic Marketing, Recent trends in India's Export Trade, Modes of entry in international business. International marketing environment. International institutions: World Bank, IMF, UNCTAD, WTO, Regional grouping, FTA, Common markets, Custom unions and economic union. Constraints in international marketing: Fiscal & non-fiscal barriers, Non-tariff barriers, Import and Export Policy, Bilateral Trade Agreements, Export Promotion Councils, ECGC, Public sector trading agencies. International marketing mix: Product decisions & international product life cycle, Pricing decisions, distribution channel decisions. Export documentation and procedures, registration of exporters, export quotations, negotiations of document, bill of lading, bill of exchange, letter of credit. Shipping and transportation of Goods, Insurance of Goods.

Consumer behaviour, consumer buying process. Determination of CB: Personality, Attitude, Motivation, Perception, and Learning with their applications in the study of CB; Family and Lifestyle; Social class and consumer behaviour. Models of consumer behaviour: Howard Sheth Model, Engel Blackwell,. Family decision-making model.

Rural Markets in India; Agriculture Marketing – Organization and functions; Classification of Agricultural Products. Marketing of goods and services in rural markets-Design of Marketing Mix. Cooperative Marketing in India. Retailing System; structure and Functions; Retailing Mix Retail Store Location and Layouts; Creative Display; Retail Pricing; Retail Promotions; Forms of retailing: Franchising, Direct Marketing, Chain Stores, Exclusive Shops and E-Retailing.

ACCOUNTING AND FINANCIAL MANAGEMENT

Financial Accounting, Recording of Accounting Transactions-Journal-Its Division Cashbook, Bank Reconciliation Statement, Rectification of Errors. Corporate Accounting-Shares & Debentures. Financial Statement Analysis-Ratio, Fund Flow Statement and Cash Flow Statement, Price Level Change and Accounting. Managerial Accounting-Concept, Cost Accounting and Managerial Accounting Management Process and Roll of Management Accounting, Cost Concept and Classification-cost, Expenditures, Fixed Cost, Variable Cost, Opportunity Cost, Sunk Cost, Relevant Cost, Different Cost, Cost For Control; Controllable and Uncontrollable Cost, Standard Cost, Joint Cost. Product Costing-Job Costing and Process Costing, Job Cost Sheets and Job Ledger, Contract Costing, Process Costing, Standard Costing & Variance Analysis, Cost-Volume-Profit Analysis-Techniques, Budgeting and Zero Base Budgeting.

Financial Management, Time value of money, Valuation of long-term securities, Risk and return. Investment Decision: Cost of capital, Capital budgeting and its methods. Financing Decision: Sources of finance; Leverage; Capital structure-theories. Dividend Decision, Dividend valuation models. Working Capital Management; Determinants of working capital; major issues in working capital management and financing of working capital.

Security analysis; Investment Vs. Speculation; Primary market (new issues market), Secondary market, Operations of Indian capital market; Listing of Securities; Mechanics of Investing. Market Brokers; Market Indices; Security Credit Ratings; Valuation of securities: Bond analysis, risk immunization; Common stock analysis-Equity valuation.

Risk & Return Analysis; Government Securities; Non-Security Forms of Investment; Security Analysis: Fundamental & Technical Approach. Portfolio Management, Portfolio Selection & its models, Markovitz model, Capital Asset Pricing Model (CAPM), Arbitrage Pricing theory. Unleveraged & leveraged Portfolio, Application of market model in portfolio construction, Constructing Efficient Frontier, Investment Timing and Portfolio Performance Evaluation.

Income-tax; Residential status of company; Computation of income and tax liability of a company; Set-off and carry-forward of losses, Deductions and exemptions in additional tax on undistributed profit. Meaning and Scope of tax planning; Location of undertaking, Ownership pattern; Tax planning regarding dividend policy, issue of bonus shares, inter- corporate dividends & transfers. Tax planning relating to Amalgamation and Merger of companies, Tax planning in respect of managerial remuneration, foreign collaborations and joint ventures, Implications of avoidance of double taxation relief agreements. Tax considerations in respect of specific managerial decisions like Make or Buy, Own or Lease, Close or Continue, Sale in domestic markets or Export,

Replacements and Capital budgeting decisions etc. Goods & Services Tax(GST), Components of GST, CGST,SGST,IGST

Multinational Finance Management: Evolution of the International monetary & Financial System, Nature and Scope of IFM. International financial markets, IMF and World Bank, Nature of Foreign Exchange Market, Currency Futures & Options. SWAP Market. Foreign Exchange Risk Management- Exchange Rate Risk assessment & techniques of covering Risk, Interest Rate Risk Management- Measures, Foreign Risk Exposure- Concept, types and techniques.

International investment and Foreign Operation, financing foreign operations including international projects. Short term international finance: International dimensions of cash management, management of receivables and inventory. Financial institutions and economic growth; Economic growth & capital formation, Problems of capital formation in under developed countries. Types of financial institution; money & capital market, money market institutions, central bank, commercial banks, Indigenous financial agencies, discounting houses Accepting houses, Capital market institution, Investment Banks, Merchant banks, Development banks, mutual funds.

Banking law & regulation, provision of RBI's regulation, credit & monetary planning, Insurance companies, Development Banks, Role of Development Banking in industrial financing in India. Financial planning of financial institutions, IFCI, ICICI, IDBI, UTI, LIC, Mutual funds. Capital adequacy, capital planning, strategy of growth, International aspects of F.I. NBFC's: types of NBFC's , Objectives, Functions, Role of NBFC's in economic growth.

Foreign Exchange Market: Types & Transactions, Quoting foreign exchange rate, spot rates, cross rates, forward rates. Currency futures & options, future Vs forward market, Hedging, Mechanism of option trading, Foreign exchange rate projections; forecasting techniques; technical & fundamental forecasting, mixed forecasting. Parameters & Constraints on exposure management; Financial & Socio-political factors, Tax treatment of foreign exchange gains & losses, FEMA.

HUMAN RESOURCE MANAGEMENT

HRM, Corporate objectives and HR Planning, Career and Succession planning. Job analysis and role description, methods of manpower search, attracting and selecting human resources. Induction and socialization of manpower, Manpower training and development, Need, Techniques and Evaluation of training programme. Performance Appraisal and Potential Evaluation: Quantitative and Qualitative appraisal, Employee welfare and compensation.

Industrial Relations & Trade Unions, dispute Resolution and Grievance Management, Employee Empowerment. IR, IR and emerging socio economic scenario. Trade Unionism: functions of trade unions. Emergence of trade union in India. Industrial Conflict: Disputes. Types of strikes & lockouts. IR machinery: code of discipline, standing orders, preventive machinery, settlement machinery, conciliation, court of enquiry, voluntary arbitration, adjudication. Collective Bargaining, its principles. Emerging Trends in CB. Employee Empowerment & quality management. Industrial Relations & Technological Change. Industrial Relations & Globalization, Trade union strategies liberalization & Technological change. Labour Flexibility & Gain Sharing.

Training & development. Role, Responsibilities & challenges to training managers, Organization & Management of Training function. Learning process, training climate and pedagogy, development training modules. Training methods & techniques, facilities planning and training aids. Training communication, training evaluation, training and development in India.

Organisational change: Management of Change, Overcoming Resistance to change. Approaches to Problem Diagnosis, Techniques of Planned Change. Organisation Development Skills. Interpersonal, Team, Intergroup and System. Evaluation of Organisation Development, Ethics of Organisation Development, Future of Organisation Development.

Labour laws and their socio-economic environment. Laws relating to discharge, Misconduct, Domestic enquiry, Disciplinary action. Socio-security laws - laws relating to Workmen's compensation, Employees state insurance, Provident fund, Gratuity and Maternity relief. Wages and Bonus laws, Payment of bonus, laws relating to working conditions. Establishment and contract labour, interpretations of labour laws, their working and implications for management, union, workmen, the economy and the industry.

HRD, strategic planning approach. Principles of Learning, Learning and behaviour, Teaching/Learning debate, Management Development. MD policy and committees, planning strategies and programme to reach MD objectives, training methodology, training process.

Management effectiveness audit; designing training for effective learning. Conduction of MD programme – role of programme coordinator, trainee, top management; evaluation.

Counseling concept, Essential elements of counseling, personal qualities of the counselor. Counseling skills, counseling approaches, planning counseling skills training, running CST. Evaluating counseling skills workshops, self and peer evaluation, an evaluation questionnaire. Employee counseling, concept, need functions, procedure, pre-requisites.

The Indian Contract Act, 1872: Essential of A Valid Contract Agreement, Performance of Contracts, Breach of Contract & Remedies, Quasi-Contracts. The Companies Act, 1956: Nature and Type of Companies, Formation, Memorandum and Articles of Association, Prospectus Allotment of Shares & Share Capital, Membership, Borrowing powers, Management & Meeting. Compromise Arrangements and Reconstruction, Prevention of Oppression & Management. Winding Up. The Sale of Good Act, 1930: Formation of Contract, Conditions & Warranties, Rights of an Unpaid Seller. Performance of the Contract of Sale. The Negotiable Instruments Act, 1881: Nature and Types, Negotiation and Assignment, Holder-in-Due Course, Dishonour and Discharge of Negotiable Instrument. Arbitration. Indian Partnership Act, 1930: Nature and Formation of Partnership, Registration of Firm, Rights and Duties of The Firm, Dissolution of the Firm.

PRODUCTION AND OPERATIONS MANAGEMENT

Production and operations management, Evolution from production to operations management, Productivity-Measurement and variables, OM system model. Types of production systems, intermittent production-project, jobbing, batch production. Continuous production- mass production. Location decisions, Location models-factors rating method, locational break even analysis, centre of gravity method, Geographical Information System (GIS). Layout decisions, types of layout. Inventory management, ABC analysis, EOQ, Quality management, TQM, JIT, ISO certifications.

Operations Research, Linear Programming Problems, Solution to Linear Programming Problems: Graphic Method; Simplex method, solution to maximization and minimization problem, Big M method, Duality in LP & sensitivity analysis. Transportation Problems and Solution, Unbalanced Transportation Problem, Degeneracy, Assignment Problems and solutions, Unbalanced Assignment Problem, Traveling salesman problem. Queuing Theory: General structure of Queuing system, Deterministic queuing model, Probabilistic Queuing model: Poisson exponential, Single server model-infinite population model only. Theory of Games: Two person Zero sum game, Solution of $2 \times n$ and $m \times 2$ games with their applications. PERT & CPM: Problems and Solutions. Simulation: Monte Carlo simulation, Application of simulation.

Total Quality Management, approaches and models-Fuji Xerox, Model, Norman Rickard Model, Difference Between Quality and Total Quality; TQM versus Management; Cost of Quality. Contributions of TQM Gurus – W. Edwards Deming, Joseph M Juran, Philip B Crosby, Kaoru Ishikawa. Quality-planning process, Quality improvement methodologies; Problems solving process and Management tools; Kaisen-Continuous improvement; Quality Circles; Six Sigma and Statistical Process control; Benchmarking; Important issues of TQM – Team work, leadership, Business Process Re-engineering; Creating Quality culture. An Introduction to Quality System Standards and ISO 14000

Project Planning: Generation and screening of project ideas, Monitoring the Environment, Corporate Appraisal, Preliminary Screening, Project Life Cycle. Project Analysis: Market Demand and Situational Analysis, Demand Forecasting, Technical Analysis: Location & Site, Project Charts and Layouts, Analysis of project Risk: Type and Measures of Project Risk, Identification of Critical Sources of Risk, Sensitivity Analysis, Scenario Analysis, Decision – tree Analysis. Project Selection and Appraisal: Relevance of cost of Capital, Appraisal Critical – NPV, Benefit Cost Ratio, IRR, Critical Evaluation, Social Cost Benefit Analysis – Rationale. Project Implementation & Review: Project Management, Forms of Project Organisation, Project Control, Project Review – Performance Evaluation.

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VEER BAHADUR SINGH PURVANCHAL UNIVERSITY

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Syllabus for Assistant Professor Screening Examination-2022

Mathematics

Real Analysis: Countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum, Sequences and series, convergence, uniform continuity, differentiability, mean value theorem, uniform convergence, Riemann sums and Riemann integral, Improper Integrals, measure, directional derivative, partial derivative, derivative as a linear transformation.

Complex Analysis: Analytic functions, Cauchy-Riemann equations, power series, Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Open mapping theorem. Taylor series, Laurent series, calculus of residues, Conformal mappings, Mobius transformations.

Numerical Analysis: Interpolation: Lagrange and Newton forms of interpolating polynomial, Numerical integration, Numerical solutions of nonlinear equations: bisection method, secant method, Newton-Raphson method, fixed point iteration, Numerical solution of initial value problems for ordinary differential equations: Methods of Euler, Runge-Kutta method of order 2.

Functional Analysis: Normed linear spaces, Banach spaces, Hahn-Banach theorem, open mapping and closed graph theorems, Inner-product spaces, Hilbert spaces, orthonormal bases.

Algebra: Euler's ϕ -function, Groups, subgroups, normal subgroups, quotient groups, homomorphisms, cyclic groups, permutation, groups, Cayley's theorem, class equations, Sylow theorems, Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain, Polynomial rings and irreducibility criteria.

Linear Algebra: Vector spaces, subspaces, linear dependence, basis, dimension, linear transformations, Matrices, linear equations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem. Matrix representation of linear transformations, canonical forms, diagonal forms, triangular forms, Jordan forms, Quadratic forms, reduction and classification of quadratic forms.

Topology: Basis, dense sets, Metric spaces, compactness, connectedness and compactness.

Differential Equations: Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, General theory of homogenous and non-homogeneous linear ODEs, variation of parameters, Sturm-Liouville boundary value problem, Classification of first order PDEs, Cauchy problem for first order PDEs, Classification of second order PDEs, canonical forms, General solution of higher order PDEs with constant coefficients, Method of separation of variables.

Calculus of Variations: Euler-Lagrange equation, Necessary and sufficient conditions for extrema, Variational methods for boundary value problems in ordinary and partial differential equations.

Linear Integral Equations: Linear integral equation of the first and second kind of Fredholm and Volterra type, Solutions with separable kernels, Characteristic numbers and eigenfunctions, resolvent kernel.

Classical Mechanics: Degree of freedom, Generalized coordinates, Lagrange's equations, Hamilton's canonical equations, Hamilton's principle, Two-dimensional motion of rigid bodies, Euler's dynamical equations for the motion of a rigid body about an axis.

Operation Research: Linear programming problems, simplex methods, duality, Transportation and assignment problems.

Subject : COMPUTER SCIENCE AND ENGINEERING

Unit - 1: Discrete Structures and Optimization Mathematical Logic: Propositional and Predicate Logic, Propositional Equivalences, Normal Forms, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference. Sets and Relations: Set Operations, Representation and Properties of Relations, Equivalence Relations, Partially Ordering. Counting, Mathematical Induction and Discrete Probability: Basics of Counting, Pigeonhole Principle, Permutations and Combinations, Inclusion- Exclusion Principle, Mathematical Induction, Probability, Bayes' Theorem. Group Theory: Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of Group Theory. Graph Theory: Simple Graph, Multigraph, Weighted Graph, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planner graph, Graph Coloring, Bipartite Graphs, Trees and Rooted Trees, Prefix Codes, Tree Traversals, Spanning Trees and Cut-Sets. Boolean Algebra: Boolean Functions and its Representation, Simplifications of Boolean Functions. Optimization: Linear Programming - Mathematical Model, Graphical Solution, Simplex and Dual Simplex Method, Sensitive Analysis; Integer Programming, Transportation and Assignment Models, PERT-CPM: Diagram Representation, Critical Path Calculations, Resource Levelling, Cost Consideration in Project Scheduling.

Unit - 2: Computer System Architecture , Digital Logic Circuits and Components: Digital Computers, Logic Gates, Boolean Algebra, Map Simplifications, Combinational Circuits, Flip-Flops, Sequential Circuits, Integrated Circuits, Decoders, Multiplexers, Registers and Counters, Memory Unit. Data Representation: Data Types, Number Systems and Conversion: Octal, Hexadecimal, decimal, and binary. 2's and 1's Complements, Fixed Point Representation, Floating Point Representation, Error Detection Codes, Computer Arithmetic - Addition, Subtraction, Multiplication and Division Algorithms. Register Transfer and Microoperations: Register Transfer Language, Bus and Memory Transfers, Arithmetic, Logic and Shift Microoperations. Basic Computer Organization and Design: Stored Program Organization and Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output, Interrupt. Programming the Basic Computer: Machine Language, Assembly Language, Assembler, Program Loops, Subroutines,

Input-Output Programming. Microprogrammed Control: Control Memory, Address Sequencing, Design of Control Unit. Central Processing Unit: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, RISC Computer, CISC Computer. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing Array Processors. Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA, Serial Communication. Memory Hierarchy: Main Memory, Auxillary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware. Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Interprocessor Communication and Synchronization, Cache Coherence, Multicore Processors.

Unit - 3: Programming Languages and Computer Graphics Language Design and Translation Issues: Programming Language Concepts, Paradigms and Models, Programming Environments, Virtual Computers and Binding Times, Programming Language Syntax, Stages in Translation, Formal Transition Models. Elementary Data Types: Properties of Types and Objects; Scalar and Composite Data Types. Programming in C: Tokens, Identifiers, Data Types, Sequence Control, Subprogram Control, Arrays, Structures, Union, String, Pointers, Functions, File Handling, Command Line Argumaents, Preprocessors. Object Oriented Programming: Class, Object, Instantiation, Inheritance, Encapsulation, Abstract Class, Polymorphism. Programming in C++: Tokens, Identifiers, Variables and Constants; Data types, Operators, Control statements, Functions Parameter Passing, Virtual Functions, Class and Objects; Constructors and Destructors; Overloading, Inheritance, Templates, Exception and Event Handling; Streams and Files; Multifile Programs. Web Programming: HTML, DHTML, XML, Scripting, Java, Servlets, Applets. Computer Graphics: Video-Display Devices, Raster-Scan and Random-Scan Systems; Graphics Monitors, Input Devices, Points and Lines; Line Drawing Algorithms, Mid-Point Circle and Ellipse Algorithms; Scan Line Polygon Fill Algorithm, Boundary-Fill and Flood Fill. 2-D Geometrical Transforms and Viewing: Translation, Scaling, Rotation, Reflection and Shear Transformations; Matrix Representations and Homogeneous Coordinates; Composite Transforms, Transformations Between Coordinate Systems, Viewing Pipeline, Viewing Coordinate Reference Frame, Window to View-Port Coordinate Transformation, Viewing Functions, Line and Polygon Clipping Algorithms. 3-D Object

Representation, Geometric Transformations and Viewing: Polygon Surfaces, Quadric Surfaces, Spline Representation, Bezier and B-Spline Curves; Bezier and B-Spline Surfaces; Illumination Models, Polygon Rendering Methods, Viewing Pipeline and Coordinates; General Projection Transforms and Clipping.

Unit – 4: Database Management Systems, Database System Concepts and Architecture:

Data Models, Schemas, and Instances; Three-Schema Architecture and Data Independence; Database Languages and Interfaces; Centralized and Client/Server Architectures for DBMS. Data Modeling: Entity-Relationship Diagram, Relational Model - Constraints, Languages, Design, and Programming, Relational Database Schemas, Update Operations and Dealing with Constraint Violations; Relational Algebra and Relational Calculus; Codd Rules. SQL: Data Definition and Data Types; Constraints, Queries, Insert, Delete, and Update Statements; Views, Stored Procedures and Functions; Database Triggers, SQL Injection. Normalization for Relational Databases: Functional Dependencies and Normalization; Algorithms for Query Processing and Optimization; Transaction Processing, Concurrency Control Techniques, Database Recovery Techniques, Object and Object-Relational Databases; Database Security and Authorization. Enhanced Data Models: Temporal Database Concepts, Multimedia Databases, Deductive Databases, XML and Internet Databases; Mobile Databases, Geographic Information Systems, Genome Data Management, Distributed Databases and Client-Server Architectures. Data Warehousing and Data Mining: Data Modeling for Data Warehouses, Concept Hierarchy, OLAP and OLTP; Association Rules, Classification, Clustering, Regression, 4 Support Vector Machine, K-Nearest Neighbour, Hidden Markov Model, Summarization, Dependency Modeling, Link Analysis, Sequencing Analysis, Social Network Analysis. Big Data Systems: Big Data Characteristics, Types of Big Data, Big Data Architecture, Introduction to Map-Reduce and Hadoop; Distributed File System, HDFS. NOSQL: NOSQL and Query Optimization; Different NOSQL Products, Querying and Managing NOSQL; Indexing and Ordering Data Sets; NOSQL in Cloud.

Unit – 5: System Software and Operating System:

Machine, Assembly and High-Level Languages; Compilers and Interpreters; Loading, Linking and Relocation; Macros, Debuggers. Basics of Operating Systems: Operating System Structure, Operations and Services; System Calls, Operating-System Design and Implementation; System Boot. Process Management:

Process Scheduling and Operations; Interprocess Communication, Communication in Client-Server Systems, Process Synchronization, Critical-Section Problem, Peterson's Solution, Semaphores, Synchronization. Threads: Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues. CPU Scheduling: Scheduling Criteria and Algorithms; Thread Scheduling, Multiple Processor Scheduling, Real-Time CPU Scheduling. Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance and Detection; Recovery from Deadlock. Memory Management: Contiguous Memory Allocation, Swapping, Paging, Segmentation, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files. Storage Management: Mass-Storage Structure, Disk Structure, Scheduling and Management, RAID Structure. File and Input/Output Systems: Access Methods, Directory and Disk Structure; File System Mounting, File Sharing, File-System Structure and Implementation; Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance; Recovery, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations. Security: Protection, Access Matrix, Access Control, Revocation of Access Rights, Program Threats, System and Network Threats; Cryptography as a Security Tool, User Authentication, Implementing Security Defenses. Virtual Machines: Types of Virtual Machines and Implementations; Virtualization. Linux Operating Systems: Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output; Interprocess Communication, Network Structure. Windows Operating Systems: Design Principles, System Components, Terminal Services and Fast User Switching; File System, Networking. Distributed Systems: Types of Network based Operating Systems, Network Structure, Communication Structure and Protocols; Robustness, Design Issues, Distributed File Systems.

Unit – 6: Software Engineering, Software Process Models: Software Process, Generic Process Model – Framework Activity, Task Set and Process Patterns; Process Lifecycle, Prescriptive Process Models, Project Management, Component Based Development, Aspect-Oriented Software Development, Formal Methods, Agile Process Models – Extreme Programming (XP), Adaptive Software Development, Scrum, Dynamic System Development Model, Feature Driven Development, Crystal, Web Engineering. Software Requirements: Functional and Non-Functional Requirements; Eliciting Requirements, Developing Use Cases, Requirement Analysis

and Modeling; Requirements Review, Software Requirement and Specification (SRS) Document. Software Design: Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Cohesion and Coupling; Object-Oriented Design, Data Design, Architectural Design, User Interface Design, Component Level Design. Software Quality: McCall's Quality Factors, ISO 9126 Quality Factors, Quality Control, Quality Assurance, Risk Management, Risk Mitigation, Monitoring and Management (RMMM); Software Reliability. Estimation and Scheduling of Software Projects: Software Sizing, LOC and FP based Estimations; Estimating Cost and Effort; Estimation Models, Constructive Cost Model (COCOMO), Project Scheduling and Staffing; Time-line Charts. Software Testing: Verification and Validation; Error, Fault, Bug and Failure; Unit and Integration Testing; White-box and Black-box Testing; Basis Path Testing, Control Structure Testing, Deriving Test Cases, Alpha and Beta Testing; Regression Testing, Performance Testing, Stress Testing. Software Configuration Management: Change Control and Version Control; Software Reuse, Software Re-engineering, Reverse Engineering. Software Design Pattern

Unit – 7: Data Structures and Algorithms Data Structures: Arrays and their Applications; Sparse Matrix, Stacks, Queues, Priority Queues, Linked Lists, Trees, Forest, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree, B* Tree, Data Structure for Sets, Graphs, Sorting and Searching Algorithms; Hashing. 6 Performance Analysis of Algorithms and Recurrences: Time and Space Complexities; Asymptotic Notation, Recurrence Relations. Design Techniques: Divide and Conquer; Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound. Lower Bound Theory: Comparison Trees, Lower Bounds through Reductions. Graph Algorithms: Breadth-First Search, Depth-First Search, Shortest Paths, Maximum Flow, Minimum Spanning Trees. Complexity Theory: P and NP Class Problems; NP-completeness and Reducibility. Selected Topics: Number Theoretic Algorithms, Polynomial Arithmetic, Fast Fourier Transform, String Matching Algorithms. Advanced Algorithms: Parallel Algorithms for Sorting, Searching and Merging, Approximation Algorithms, Randomized Algorithms.

Unit – 8: Theory of Computation and Compilers Theory of Computation: Formal Language, Non-Computational Problems, Diagonal Argument, Russels's Paradox. Regular Language Models: Deterministic Finite Automaton (DFA), Non-Deterministic Finite Automaton

(NDFFA), Equivalence of DFA and NDFFA, Regular Languages, Regular Grammars, Regular Expressions, Properties of Regular Language, Pumping Lemma, Non Regular Languages, Lexical Analysis. Context Free Language: Pushdown Automaton (PDA), Non-Deterministic Pushdown Automaton (NPDA), Context Free Grammar, Chomsky Normal Form, Greibach Normal Form, Ambiguity, Parse Tree Representation of Derivation Trees, Equivalence of PDA's and Context Free Grammars; Properties of Context Free Language. Turing Machines (TM): Standard Turing Machine and its Variations; Universal Turing Machines, Models of Computation and Church-Turing Thesis; Recursive and Recursively Enumerable Languages; Context-Sensitive Languages, Unrestricted Grammars, Chomsky Hierarchy of Languages, Construction of TM for Simple Problems. Unsolvable Problems and Computational Complexity: Unsolvable Problem, Halting Problem, Post Correspondence Problem, Unsolvable Problems for Context-Free Languages; Measuring and Classifying Complexity, Tractable and Intractable Problems. Syntax Analysis: Associativity, Precedence, Grammar Transformations, Top Down Parsing, Recursive Descent Predictive Parsing, LL(1) Parsing, Bottom up Parsing, LR Parser, LALR(1) Parser. Semantic Analysis: Attribute Grammar, Syntax Directed Definitions, Inherited and Synthesized Attributes; Dependency Graph, Evaluation Order, S-attributed and L-attributed Definitions; Type-Checking. 7 Run Time System: Storage Organization, Activation Tree, Activation Record, Stack Allocation of Activation Records, Parameter Passing Mechanisms, Symbol Table. Intermediate Code Generation: Intermediate Representations, Translation of Declarations, Assignments, Control Flow, Boolean Expressions and Procedure Calls. Code Generation and Code Optimization: Control-flow, Data-flow Analysis, Local Optimization, Global Optimization, Loop Optimization, Peep-Hole Optimization, Instruction Scheduling.

Unit - 9: Data Communication and Computer Networks Data Communication: Components of a Data Communication System, Simplex, Half Duplex and Duplex Modes of Communication; Analog and Digital Signals; Noiseless and Noisy Channels; Bandwidth, Throughput and Latency; Digital and Analog Transmission; Data Encoding and Modulation Techniques; Broadband and Baseband Transmission; Multiplexing, Transmission Media, Transmission Errors, Error Handling Mechanisms. Computer Networks: Network Topologies, Local Area Networks, Metropolitan Area Networks, Wide Area Network, Wireless Networks, Internet. Network Models: Layered Architecture, OSI Reference Model and its Protocols; TCP/IP Protocol Suite, Physical, Logical, Port and Specific Addresses; Switching Techniques.

Functions of OSI and TCP/IP Layers: Framing, Error Detection and Correction; Flow and Error Control; Sliding Window Protocol, HDLC, Multiple Access – CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, CDMA, TDMA, Network Devices, Backbone Networks, Virtual LANs. IPv4 Structure and Address Space; Classful and Classless Addressing; Datagram, Fragmentation and Checksum; IPv6 Packet Format, Mapping Logical to Physical Address (ARP), Direct and Indirect Network Layer Delivery; Routing Algorithms, TCP, UDP and SCTP Protocols; Flow Control, Error Control and Congestion Control in TCP and SCTP. World Wide Web (WWW): Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution - Mapping Names to Addresses and Addresses to Names; Electronic Mail Architecture, SMTP, POP and IMAP; TELNET and FTP. Network Security: Malwares, Cryptography and Steganography; Secret-Key Algorithms, Public-Key Algorithms, Digital Signature, Virtual Private Networks, Firewalls. Mobile Technology: GSM and CDMA; Services and Architecture of GSM and Mobile Computing; Middleware and Gateway for Mobile Computing; Mobile IP and Mobile Communication Protocol; Communication Satellites, Wireless Networks and Topologies; Cellular Topology, Mobile Adhoc Networks, Wireless Transmission and Wireless LANs; Wireless Geolocation Systems, GPRS and SMS. Cloud Computing and IoT: SaaS, PaaS, IaaS, Public and Private Cloud; Virtualization, Virtual Server, Cloud Storage, Database Storage, Resource Management, Service Level Agreement, Basics of IoT.

Unit – 10: Artificial Intelligence (AI) Approaches to AI: Turing Test and Rational Agent Approaches; State Space Representation of Problems, Heuristic Search Techniques, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures. Knowledge Representation: Logic, Semantic Networks, Frames, Rules, Scripts, Conceptual Dependency and Ontologies; Expert Systems, Handling Uncertainty in Knowledge. Planning: Components of a Planning System, Linear and Non Linear Planning; Goal Stack Planning, Hierarchical Planning, STRIPS, Partial Order Planning. Natural Language Processing: Grammar and Language; Parsing Techniques, Semantic Analysis and Pragmatics. Multi Agent Systems: Agents and Objects; Agents and Expert Systems; Generic Structure of Multiagent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools. Fuzzy Sets: Notion of Fuzziness, Membership Functions, Fuzzification and Defuzzification; Operations on Fuzzy Sets, Fuzzy Functions and Linguistic Variables; Fuzzy Relations, Fuzzy Rules and Fuzzy

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Inference; Fuzzy Control System and Fuzzy Rule Based Systems. Genetic Algorithms (GA): Encoding Strategies, Genetic Operators, Fitness Functions and GA Cycle; Problem Solving using GA. Artificial Neural Networks (ANN): Supervised, Unsupervised and Reinforcement Learning; Single Perceptron, Multi Layer Perceptron, Self Organizing Maps, Hopfield Network.

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Syllabus for the Recruitment
Test for the Post of Assistant
Professor
Subject-Biotechnology

Syllabus prescribed
by DBT (Department of
Biotechnology), Government of
India for M. Sc. Biotechnology
https://dbtindia.gov.in/sites/default/files/Remodelled-Biotech-Curriculum_MSc-Biotechnology.pdf

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