



DTE Code: EN4139

Samridhi Sarwajanik Charitable Trust's
JHULELAL INSTITUTE OF TECHNOLOGY
An Autonomous Institute affiliated to RTM Nagpur University
Off Koradi Road, Lonara, Nagpur - 441111.
Contact No.: 82086 39771, 82086 39501
E-Mail ID : admin@jitnagpur.edu.in Website : www.jitnagpuredu.in
Vision: To become an eminent institution through knowledge and research.



NAAC A+ Accredited

PATTERN OF EXAMINATION:-

- (i) The examination will be of 100 marks divided in two sections viz. Section A- Research Methodology and General Aptitude and Section B- Subject Aptitude.
- (ii) Each section will be of maximum 50 marks and the test will have MCQs carrying 1 mark each.
- (iii) The duration of the exam for each section shall be 90 minutes.
- (iv) The examination for two section will be held on the same day with a time gap of minimum one Hour between two examinations.

SYLLABUS FOR PET EXAMINATION:-

Section A- Research Methodology & General Aptitude:

This section shall have 40 multiple choice questions from Research Methodology covering (i) Meaning and Types of research, (ii) Principles of Review of Literature (iii) Defining a research problem (iv) Research Design (v) Preparing a Research Proposal (vi) Sampling Techniques (vii) Types of Data and Data Collection Techniques (viii) Data Analysis Tools and (ix) Referencing styles. Remaining 10 Questions in this section will be general aptitude including Analytical Reasoning, Numerical Ability, Data Interpretation, Computer Awareness, and Language Competency.

Section B- Subject Aptitude

This section will have 50 multiple choice questions based on the curriculum prescribed as below.

Computer Science and Engineering

Section 1 : Digital Logic and Computer Organization & Architecture

Boolean algebra. Combinational and sequential circuits. Minimization, Number representations and computer arithmetic (fixed and floating point).

Machine instructions and addressing modes, ALU, data- path and control unit, Instruction pipelining, pipeline hazards, Memory hierarchy: cache, main memory and secondary storage; I/O interrupt and DMA mode).

Section 2 : Programming and Data Structures & Algorithms

Programming in C, Recursion, Arrays, stacks, queues, linked lists , trees, binary search trees, binary heaps, graphs.

Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer, Graph traversals, minimum spanning trees, shortest paths

Section 3 : Theory of Computation and Compiler Design

Regular expression and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.

Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation. Local optimization, Data flow analyses: constant propagation, liveness analysis, common sub expression elimination.

Section 4: Operating System and Database

System calls, processes, threads, inter-process communication, concurrency and synchronization.

Deadlock, CPU and I/O scheduling. Memory management and virtual memory, File system.

ER- model. Relational model: relational algebra, tuple calculus, SQL Integrity constraints, normal forms. File organization, indexing(e.g. , B and B+ trees). Transactions and concurrency control.

Section 5: Computer Networks

Concept of layering: OSI and TCP/IP Protocol Stacks; Basics of packet, circuit and virtual circuit-switching; Data link layer: framing, error detection, Medium Access Control, Ethernet bridging; Routing protocols: shortest path, flooding, distance vector and link state routing; Fragmentation and IP addressing , IP4, CIDR notation, Basics of IP support protocols(ARP, DHCP, ICMP), Network Address Translation(NAT); Transport layer: flow control and congestion control, UDP, TCP ,sockets; Application layer protocols: DNS,SMTP,HTTP,FTP, Email.

Electronics Engineering

Unit-I: Electronics Devices

P-N junction diode, Zener diode, Simple diode circuits: clipping, clamping and rectifiers, BJT and MOSFETs; Single stage BJT amplifiers: biasing, bias stability, small signal analysis and frequency response, JFET and its characteristics, Pinch off voltage, Drain saturation current, JFET amplifiers and its analysis using small signal JFET model, biasing of FET. MOSFET amplifiers, LED, Photodiode. Principle of positive and negative feedback, Concept of stability in electronics circuits, Oscillators and multivibrator, Power amplifiers.

Unit-II: Analog Circuits

Operational Amplifiers: Basic differential Amplifier using transistor and its operation, OP-

Amp parameters, Characteristic and definition, Ideal OP-Amp, Equivalent circuit, Inverting and Non -Inverting configurations and design.

OP-Amp Linear and nonlinear applications: Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrators and differentiators, Comparators, Schmitt trigger, clipper and damper, Precision rectifiers, PLL. Multivibrators: Bistable, Monostable, Astable multivibrator circuits using IC 555, Sample and hold circuits, Voltage reference circuits; Power supplies: ripple removal and regulation.

Unit-III: Networks, Signal and Systems, Control systems

Network Theorems: Superposition, Thevenin and Norton's, Maximum power transfer; Wye-Delta transformation: Time domain analysis of simple linear circuits; solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; 2-port network parameters: driving point and transfer functions; Fourier series and Fourier transform representations, sampling theorem and applications.

Digital signal processing: Discrete time Fourier transform (DTFT), DFT, FFT, Z-Transform, LTI systems, properties, impulse response, convolution, system stability conditions. Digital filter design techniques. Control system: Basic control system components, Feedback principle, Transfer function; block diagram representation, signal flow graph; Transient and steady state analysis of LTI systems, Frequency response, Routh- Hurwitz and Nyquist stability criteria.

Unit-IV: Digital circuits & Microprocessor

Combinational circuits: Boolean algebra, minimization of functions using Boolean identities and K-map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders and PLAs; **Sequential:** latches and flip-flops, counters, shift registers and finite state machines; data converters: sample and hold circuits, ADC and DACs; Semiconductor memories: ROM, SRAM, DRAM; 8-bit microprocessor

(8085): Block diagram, functional description and pin details- addressing modes, complete instructions set and assembler directives- interrupt processing.

Unit- V: Communication

Analog communication: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, super heterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem. Digital Communication: PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying(ASK,PSK,FSK),QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; fundamentals of error correction, Hamming codes; Timing and frequency synchronization, inter-symbol interference and its mitigation. Basics of TDMA, FDMA, CDMA and OFDMA techniques.

Ph.D Entrance Test (PET)
Syllabus for Section – B
Subject: Business Administration and Business Management

Question Paper Pattern:

1. The question paper shall have total 50 Multiple Choice Questions carrying 1 mark each.
2. Each unit shall have 10 Multiple Choice Questions

Unit – I Business Management and Entrepreneurship

Management – Concept, Process, Theories and Approaches, Management Roles and Skills; Functions – Planning, Organizing, Staffing, Coordinating and Controlling; Communication – Types, Process and Barriers. Decision Making – Concept, Process, Techniques and Tools
Organization Structure and Design – Types, Authority, Responsibility, Centralization, Decentralization and Span of Control

Entrepreneurship Development – Concept, Types, Theories and Process, Developing Entrepreneurial Competencies; Intrapreneurship – Concept and Process; Innovations in Business – Types of Innovations, Creating and Identifying Opportunities, Screening of Business Ideas; Business Plan and Feasibility Analysis – Concept and Process of Technical, Market and Financial Analysis

Unit II – Human Resource Management and Organizational Behaviour

Organizational Behaviour – Significance & Theories

Individual Behaviour – Personality, Perception, Values, Attitude, Learning and Motivation

Group Behaviour – Team Building, Leadership, Group Dynamics

Interpersonal Behaviour & Transactional Analysis

Organizational Culture & Climate

Human Resource Management – Concept, Perspectives, Influences and Recent Trends

Human Resource Planning, Recruitment and Selection, Induction, Training and Development; Job Analysis, Job Evaluation and Compensation Management; Performance Management and Appraisal; Organization Development, Change & OD Interventions; Employee Engagement & Work Life Balance; Industrial Relations: Disputes & Grievance Management, Labour Welfare and Social Security; Trade Union & Collective Bargaining; Green HRM

Unit III - Managerial Accounting & Financial Management

Financial Statement Analysis – Ratio Analysis, Funds Flow and Cash Flow Analysis, DuPont Analysis; Preparation of Cost Sheet, Marginal Costing, Cost Volume Profit Analysis; Budgeting and Budgetary Control; Financial Management, Concept & Functions, Capital Structure – Theories, Cost of Capital, Sources and Finance, Leverages – Operating, Financial and Combined Leverages, EBIT–EPS Analysis, Financial Breakeven Point & Indifference Level.; Value & Returns – Time Preference for Money, Valuation of Bonds and Shares, Risk and Returns; Capital Budgeting – Nature of Investment, Evaluation, Comparison of Methods; Risk and Uncertainty Analysis; Dividend – Theories and Determination; Working Capital Management – Determinants, Cash, Inventory, Receivables and Payables Management, Factoring

Unit IV - Marketing Management and International Business

Marketing – Concept, Market Segmentation, Positioning and Targeting; Product and Pricing Decision – Product Mix, Product Life Cycle, New Product development, Pricing – Types and Strategies; Place and promotion decision – Marketing channels and value networks, VMS, IMC, Advertising and Sales promotion; Consumer and Industrial Buying Behaviour: Theories and Models of Consumer Behaviour; Brand Management – Role of Brands, Brand Equity, Equity Models, Developing a Branding Strategy; Brand Name Decisions, Brand Extensions and Loyalty; Personal Selling; Service Marketing – Managing Service Quality and Brands, Customer Relationship Marketing; Retail Marketing; Emerging Trends in Marketing – Concept of e-Marketing, Direct Marketing, Digital Marketing and Green Marketing
International Business – Managing Business in Globalization Era; Theories of International Trade; Balance of payment; Foreign Direct Investment – Benefits and Costs; Multilateral regulation of Trade and Investment under WTO

Unit V – Strategic Management

Strategic Management – Concept, Process, Decision & Types; Strategic Analysis – External Analysis, PEST, Porter's Approach to industry analysis, Internal Analysis – Resource Based Approach, Value Chain Analysis; Strategy Formulation – SWOT Analysis, Corporate Strategy – Growth, Stability, Retrenchment, Integration and Diversification, Business Portfolio Analysis – BCG, GE Business Model, Ansoff's Product Market Growth Matrix, Mckinsey 7s Framework