# Syllabus of Written Examination for the Faculty Recruitment (Assistant Professor on Contract)

## PHARMACEUTICAL SCIENCES

**PHARMACEUTICS:** Matter, Properties of Matter, Micromeretics and Powder Rheology, Surface and Interfacial Phenomenon, Viscosity and Rheology, Dispersion Systems, Complexation, Kinetics and Drug Stability, Microbiology in Pharmacy, Sterilization, Immunology and Immunological Preparations, Genetic Recombination, Pharmaceutical Jurisprudence & Ethics, Prescription/Non-prescription Products, Dispensing and Community Pharmacy, Organization and Structure of Hospital Pharmacy, Drug Information Services, Records and Reports, Pharmacoepidemiology, Nuclear Pharmacy, Unit Operations in Manufacturing, Stoichiometry, Material of Construction, Material Handling Systems, Corrosion, Plant Location, Industrial Hazards and Safety Precautions, Automated Process Control Systems.

Dosage Forms, Designing & Evaluation: Pre-formulation studies, Liquid Dosage Forms, Semisolid Dosage Forms, Suppositories, Extraction and Galenical Products, Blood Products and Plasma Substitutes, Pharmaceutical Aerosols, Ophthalmic Preparations, Cosmeticology and Cosmetic Preparations, Capsules, Micro-encapsulation, Tablets, Coating of Tablets, Parenteral Products, Surgical Products, Packaging of Pharmaceutical Products, Performance Evaluation Methods, Biopharmaceutics & Pharmacokinetics, Clinical Pharmacokinetics, Bioavailability and Bioequivalence

**PHARMACEUTICAL CHEMISTRY**: Inorganic Pharmaceutical & Medicinal Chemistry, Inorganic Radiopharmaceuticals, Physical Chemistry and its importance in pharmacy, Organic Chemistry and its importance in pharmacy, Biochemistry in Pharmaceutical Sciences, Physico-chemical and stereoisomeric (optical, geometrical) aspects of drug molecules and biological action, Bioisosterism, Microbial Transformations, Enzyme Immobilization Drug-receptor interactions including transduction mechanisms. Drug Metabolism and Concept of Prodrugs; Principles of Drug Design

Traditional analog and mechanism-based approaches, QSAR approaches, Applications of quantum mechanics, Computer-Aided Drug Designing (CADD) and molecular modeling.

Synthetic Procedures, Mode of Action, Uses, Structure Activity Relationships (including Physicochemical Properties) of the various Classes of Drugs: Drugs Acting at Synaptic and Neuro-Effector Junction Sites, Autacoids, Steroidal Drugs, Drugs Acting on the Central Nervous System, Diuretics; Cardiovascular Drugs, Thyroid and Antithyroid Drugs, Insulin and Oral Hypoglycemic Agents, Chemotherapeutic Agents.

Different Techniques of Pharmaceutical Analysis, Preliminaries, and Definitions, Fundamentals of Volumetric Analysis, Acid-Base Titrations, Oxidation-Reduction Titrations, Precipitation Titrations, Gravimetric Analysis, Non-Aqueous Titrations, Complexometric Titrations, Miscellaneous Methods of Analysis, Extraction Procedures, Instrumental Methods, Potentiometry, Conductometry, Coulometry, Polarography, Amperometry, Chromatography, Spectroscopic Techniques: UV-Vis, Fluorimetry, IR, NMR, Mass Spectrometry (EI & CI), Flame Photometry, Atomic Absorption, X-ray Diffraction, Radioimmunoassay.

Quality Assurance: GLP, ISO 9000, TQM, Quality Review and documentation, Regulatory control, Regulatory drug analysis, Interpretation of analytical data, Validation, Quality audit (equipment validation, analytical procedure validation).

**PHARMACOLOGY:** Pathophysiology of Common Diseases, Basic Principles of Cell Injury and Adaptations, Basic Mechanisms Involved in the Process of Inflammation and Repair, Immunopathophysiology, Pathophysiology of Common Diseases. Fundamentals of general pharmacology, Adverse Drug Reactions, Bioassay of Drugs and Biological Standardization, Discovery and development of new drugs, Bioavailability and bioequivalence studies. Pharmacology of Peripheral Nervous System, Pharmacology of Central Nervous System, Pharmacology of Cardiovascular System, drugs acting on the hemopoietic system, Drugs acting on the respiratory system: drugs acting on urinary system, autacoids, drugs acting on the gastrointestinal tract, Pharmacology of endocrine system, chemotherapy, principles of toxicology, basic concepts of pharmacotherapy, Important disorders of organs, systems, and their management: cardiovascular disorders, cns disorders, respiratory disease, gastrointestinal disorders, endocrine disorders, infectious diseases, hematopoietic disorders, joint and connective tissue disorders, neoplastic diseases, therapeutic drug monitoring, concept of essential drugs and rational drug use.

**PHARMACOGNOSY:** Sources of Drugs, Classification of Drugs, Study of medicinally important plants belonging to the families: Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Graminae, Labiatae, Cruciferae, Papaveraceae. Cultivation, Collection, Processing, and Storage of Crude Drugs, Quality Control of Crude Drugs, Adulteration of crude drugs and their detection**,** Introduction to Active Constituents of Drugs.

Systematic Pharmacognostic Study of: Carbohydrates and Derived Products, Lipids, Resins, Tannins, Volatile Oils.

Phytochemical Screening, Preparation of extracts, Fibers, Study of Biological Sources, Cultivation, and Diagnostic Features of Drugs: Glycoside-Containing Drugs, Alkaloid-Containing Drugs, Enzymes, Studies of Traditional Drugs, Holistic concept of drug administration in traditional systems, Introduction to Ayurvedic preparations**:** Arishtas, Asavas, Gutikas, Tailas, Churnas, Lehyas, Bhasmas, General Techniques of Biosynthetic Studies and Metabolic Pathways, Role of Plant-Based Drugs in National Economy**,** Plant Tissue Culture, Marine Pharmacognosy, Natural allergens, photosensitizing agents, fungal toxins, Herbs as health foods and cosmetics, Standardization and quality control of herbal drugs (WHO guidelines).

# Syllabus of Written Examination for the Faculty Recruitment
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# CHEMISTRY

**Inorganic Chemistry:**

1. Chemical periodicity
2. Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory).
3. Concepts of acids and bases, Hard-Soft acid base concept, Non-aqueous solvents.
4. Main group elements and their compounds: Allotropy, synthesis, structure and bonding, industrial importance of the compounds.
5. Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms.
6. Inner transition elements: spectral and magnetic properties, redox chemistry, analytical applications.
7. Organometallic compounds: synthesis, bonding and structure, and reactivity. Organometallics in homogeneous catalysis.
8. Cages and metal clusters.
9. Analytical chemistry- separation, spectroscopic, electro- and thermoanalytical methods.
10. Bioinorganic chemistry: photosystems, porphyrins, metalloenzymes, oxygen transport, electron- transfer reactions; nitrogen fixation, metal complexes in medicine.
11. Characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, NQR, MS, electron spectroscopy and microscopic techniques.
12. Nuclear chemistry: nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.

**Physical Chemistry**:

1. Basic principles of quantum mechanics: Postulates; operator algebra; exactly-solvable systems: particle-in-a-box, harmonic oscillator and the hydrogen atom, including shapes of atomic orbitals; orbital and spin angular momenta; tunneling.
2. Approximate methods of quantum mechanics: Variational principle; perturbation theory up to second order in energy; applications.
3. Atomic structure and spectroscopy; term symbols; many-electron systems and antisymmetry principle.
4. Chemical bonding in diatomics; elementary concepts of MO and VB theories; Huckel theory for conjugated π-electron systems.
5. Chemical applications of group theory; symmetry elements; point groups; character tables; selection rules.
6. Molecular spectroscopy: Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules; basic principles of magnetic resonance.
7. Chemical thermodynamics: Laws, state and path functions and their applications; thermodynamic description of various types of processes; Maxwell's relations;

spontaneity and equilibria; temperature and pressure dependence of thermodynamic quantities; Le Chatelier principle; elementary description of phase transitions; phase equilibria and phase rule; thermodynamics of ideal and non-ideal gases, and solutions.

8. Statistical thermodynamics: Boltzmann distribution; kinetic theory of gases; partition functions and their relation to thermodynamic quantities – calculations for model systems.
9. Electrochemistry: Nernst equation, redox systems, electrochemical cells; Debye-Huckel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations.
10. Chemical kinetics: Empirical rate laws and temperature dependence; complex reactions; steady state approximation; determination of reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.
11. Colloids and surfaces: Stability and properties of colloids; isotherms and surface area; heterogeneous catalysis.
12. Solid state: Crystal structures; Bragg's law and applications; band structure of solids.
13. Polymer chemistry: Molar masses; kinetics of polymerization.
14. Data analysis: Mean and standard deviation; absolute and relative errors; linear regression; covariance and correlation coefficient.

**Organic Chemistry :**

1. IUPAC nomenclature of organic molecules including regio- and stereoisomers.
2. Principles of stereochemistry: Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.
3. Aromaticity: Benzenoid and non-benzenoid compounds – generation and reactions.
4. Organic reactive intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzynes and nitrenes.
5. Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.
6. Common named reactions and rearrangements – applications in organic synthesis.
7. Organic transformations and reagents: Functional group interconversion including oxidations and reductions; common catalysts and reagents (organic, inorganic, organometallic and enzymatic). Chemo, regio and stereoselective transformations.
8. Concepts in organic synthesis: Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups.

9. Asymmetric synthesis: Chiral auxiliaries, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions; determination of enantiomeric and diastereomeric excess; enantio-discrimination. Resolution – optical and kinetic.

10. Pericyclic reactions – electrocyclisation, cycloaddition, sigmatropic rearrangements and other related concerted reactions. Principles and applications of photochemical reactions in organic chemistry.

11. Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S).

12. Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids.

13. Structure determination of organic compounds by IR, UV-Vis, $^{1}H$ & $^{13}C$ NMR and Mass spectroscopic techniques.

# Syllabus of Written Examination for the Faculty Recruitment
# (Assistant Professor on Contract)
## Electronics and Communications Engineering Department (IOT)

**Section 1: Networks, Signals and Systems**

Circuit analysis: Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem, reciprocity. Sinusoidal steady state analysis: phasors, complex power, maximum power transfer. Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform.

Linear 2-port network parameters, wye-delta transformation.

Continuous-time signals: Fourier series and Fourier transform, sampling theorem and applications.

**Discrete-time signals:** DTFT, DFT, z-transform, discrete-time processing of continuous-time signals. LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response, group delay, phase delay.

Design of FIR Digital filters: Window method, Park-McClellan's method.

Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Band stop and High pass filters. Effect of finite register length in FIR filter design, Parametric and non-parametric spectral estimation, Introduction to multirate signal processing.

**Section 2: Electronic Devices**

Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors, physics of nanoscale devices.

Carrier transport: diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations.

P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell.

**Section 3: Analog Circuits**

**Diode circuits:** clipping, clamping and rectifiers.

BJT and MOSFET amplifiers: biasing, ac coupling, small signal analysis, frequency response. Current mirrors and differential amplifiers.

Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators.

**Section 4: Digital Circuits**

Number representations: binary, integer and floating-point- numbers. Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders.

**Sequential circuits:** latches and flip-flops, counters, shift-registers, finite state machines, propagation delay, setup and hold time, critical path delay.

**Data converters:** sample and hold circuits, ADCs and DACs.

**Semiconductor memories:** ROM, SRAM, DRA

**Computer organization:** Machine instructions and addressing modes, ALU, data-path and control unit, instruction pipelining.

**Section 5: Embedded Systems:**

The concept of embedded systems design, Embedded microcontroller cores, embedded memories. Examples of embedded systems, Technological aspects of embedded systems: interfacing between analog and digital blocks, signal conditioning, digital signal processing. sub-system interfacing, interfacing with external systems, user interfacing. Design tradeoffs due to process compatibility, thermal considerations, etc, Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

**Section 6: IoT Introduction and Fundamentals**:

Evolution of the IoT concept, Basic Characteristics of IoT, IoT Architecture, IoT components: Digital Signal Processing, Data transmission, Choice of channel (wired/wireless), back-end data analysis. Understanding packaging and power constraints for IoT implementation.

Signals, Sensors, Actuators, Interfaces : Introduction to sensors & transducers, Introduction to electrodes & biosensors, Static and dynamic characteristics of sensors, Different types of sensors, Selection criteria's for sensors / transducers, Signal conditioning modules of IoT system , Energy and power considerations, Introduction to actuators, Different types of actuators, Interfacing challenges, Modules of data acquisition system, Wireless sensor node structure, positioning topologies for IoT infrastructure.

Communication and Networking in IoT: Review of Communication Networks, Challenges in Networking of IoT Nodes, range, bandwidth Machine-to-Machine (M2M) and IoT Technology Fundamentals, Medium Access Control (MAC) Protocols for M2M Communications Standards for the IoT Basics of 5G Cellular Networks and 5G IoT Communications, Low-Power Wide Area networks (LPWAN).

Wireless communication for IoT: channel models, Communication Protocols, power budgets, data rates.

Networking and communication aspects: IPv6, 6LoWPAN, COAP, MQTT, Operating Systems need and requirements for IoT.

**Modern networking:** Cloud computing: Introduction to the Cloud Computing, History of cloud computing, Cloud service options, Cloud Deployment models, Business concerns in the cloud, Hypervisors, Comparison of Cloud providers, Cloud and Fog Ecosystem for IoT Review of architecture

**Section 7: Communications**

Random processes: auto correlation and power spectral density, properties of white noise, filtering of random signals through LTI systems.

Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, super heterodyne receivers.

Information theory: Entropy, mutual information and channel capacity theorem.

Digital communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, MAP, ML detection, matched filter receiver, SNR and BER, Channel encoder-decoder, equalizer, MIMO Channel, MIMO Antennas.

**Section 8: Electromagnetics**

Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector.

Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth.

Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart.

Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays.

# Syllabus of Written Examination for the Faculty Recruitment
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## Electrical Engineering

### Unit 1: Electric Circuits, Networks Analysis & Synthesis

Network elements, ideal voltage and current sources, dependent sources, R, L, C elements; Network solution methods: KCL, KVL, Node and Mesh analysis; Network Theorems: Thevenin's, Norton's, Superposition, Maximum Power Transfer, Reciprocity, Compensation, Millman's and Tellegen's theorems for both dc and ac circuits; Transient response of dc and ac networks, sinusoidal steady-state analysis, resonance, two port networks, balanced three phase circuits, star-delta transformation, complex power and power factor in ac circuits, graph theory; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; Two-port networks, parameters, driving point and transfer functions; Network synthesis; Filters; Attenuators.

### Unit 2: Electromagnetic Field Theory

Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Biot-Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magnetomotive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations; Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation.

### Unit 3: Signals and Systems

Representation of continuous and discrete time signals, shifting and scaling properties, linear time invariant and causal systems, Fourier series representation of continuous and discrete time periodic signals, sampling theorem and applications, Applications of Fourier Transform for continuous and discrete time signals, Laplace Transform and Z transform. R.M.S. value, average value calculation for any general periodic waveform

### Unit 4: Electrical Machines

Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three-phase transformers: connections, vector groups, parallel operation; Auto-transformer, Electromechanical energy conversion principles; DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of dc motors; Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control; Operating principle of single-phase induction motors; Synchronous machines: cylindrical and salient pole machines, performance and characteristics, regulation and parallel operation of generators, starting of synchronous motors; Types of losses and efficiency calculations of electric machines.

### Unit 5: Power Systems

Basic concepts of electrical power generation, ac and dc transmission concepts, Models and performance of transmission lines and cables, Economic Load Dispatch (with and without considering transmission losses), Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per-unit quantities, Bus admittance matrix, Gauss- Seidel and

Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential, directional and distance protection; Circuit breakers, System stability concepts, Equal area criterion.

**Unit 6: Control Systems**

Mathematical modelling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Stability analysis using Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, Solution of state equations of LTI systems.

**Unit 7: Electrical, Electronic Measurement & Instrumentation**

Bridges and Potentiometers, Measurement of voltage, current, power, energy, and power factor; Instrument transformers, Digital voltmeters and multi-meters, Phase, Time, and Frequency measurement; Oscilloscopes, Error analysis, Transducers: Type, classification and applications, Measurement of non-electrical quantities.

**Unit 8: Analog and Digital Electronics**

Simple diode circuits: clipping, clamping, rectifiers; Amplifiers: biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers: characteristics and applications; single stage active filters, Active Filters: Sallen Key, Butterworth, VCOs and timers; Number systems; Boolean algebra, minimization of functions using Boolean identities and Karnaugh map; Logic gates; Combinatorial and sequential logic circuits, multiplexers, demultiplexers, Schmitt triggers, sample and hold circuits, A/D and D/A converters.

**Unit 9: Power Electronics**

Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost Converters; Single and three-phase configuration of uncontrolled rectifiers; Voltage and Current commutated Thyristor based converters; Bidirectional ac to dc voltage source converters; Magnitude and Phase of line current harmonics for uncontrolled and thyristor based converters; Power factor and Distortion Factor of ac to dc converters; Single-phase and three-phase voltage and current source inverters, sinusoidal pulse width modulation.

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# Syllabus of Written Examination for the Faculty Recruitment
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## Humanities & Social Science Department (English)

| UNIT | CONTENTS |
|---|---|
| Unit –One | Non-Fictional Prose |
| Unit –Two | Fiction, Short story |
| Unit –Three | Poetry |
| Unit –Four | Drama |
| Unit-Five | Language: Basic concepts, theories, and pedagogy. English in Use. |
| Unit-Six | English in India: history, evolution, and futures; English Studies in India |
| Unit-Seven | ELT, ESL & SLT, Language Teaching & Testing |
| Unit Eight | Research Methods and Materials in English |
| Unit-Nine | Literary Theory |
| Unit –Ten | Literary Criticism |
| Unit –Eleven | Communication Skills |
| Unit –Twelve | Soft Skills |
| Unit –Thirteen | Cultural Studies |
| Unit –Fourteen | American Studies |
| NOTE: The first four units may also be tested through comprehension passages to assess critical reading, critical thinking and writing skills. These four units will cover all literatures in English viz. American British, Canadian, African American Literature etc.. | |

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## MANAGEMENT

**Part-A: General Aptitude**

**Teaching Aptitude:** Teaching, Learner's characteristics differences, Factors affecting teaching related to: Teacher, Learner, Support material, Instructional facilities, learning environment and Institution, Methods of teaching in Institutions of higher learning: (Swayam, Swayam Prabha, MOOCs etc.), Teaching Support System, Traditional, Modern and ICT based. Evaluation Systems.

**Research Aptitude & Ethics:** Methods of Research: Experimental, Descriptive, Historical, Qualitative and Quantitative methods. Steps of Research, Thesis and Article writing, Application of ICT in research, Research ethics. Comprehension; Plagiarism and Research Ethics, Mathematical Aptitude Logical Reasoning, Data Interpretation. Development and environment, Higher Education System.

**Part B: Management**

Unit – I

Management: Concept, Process, Theories and Approaches, Management Roles and Skills Functions. Communication: Types, Process and Barriers. Decision Making – Concept, Process, Techniques and Tools Organisation Structure and Design – Types, Authority, Responsibility, Centralisation, Decentralisation and Span of Control.

Unit – II

**Managerial Economics:** Concept & Importance Demand analysis – Utility Analysis, Indifference Curve, Elasticity & Forecasting Market Structures – Market Classification & Price Determination National Income and Measurement Business Ethics & CSR Ethical Issues & Dilemma Corporate Governance Value Based Organisation.

Unit – III

**Organisational 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 Work Force Diversity & Cross Culture Organisational Behaviour Emotions and Stress Management Organisational Justice and Whistle Blowing 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.

Unit – IV

Strategic Role of Human Resource Management Competency Mapping & Balanced Scoreboard Career Planning and Development Performance Management and Appraisal Organization Development, Change & OD Interventions Talent Management & Skill Development Employee Engagement & Work Life Balance Industrial Relations: Disputes & Grievance Management, Labour Welfare and Social Security Trade Union & Collective Bargaining International Human Resource Management – HR Challenge of International Business Green HRM.

Unit– V

**Accounting Principles and Standards:** Preparation of Financial Statements Financial Statement Analysis – Ratio Analysis, Funds Flow and Cash Flow Analysis, DuPont Analysis Preparation of Cost Sheet, Marginal Costing, Cost Volume Profit Analysis Standard Costing & Variance Analysis

**Financial Management**: Concept & Functions Capital Structure – Theories, Cost of Capital, Sources and Finance Budgeting and Budgetary Control, Types and Process, Zero base Budgeting Leverages – Operating, Financial and Combined Leverages, EBIT–EPS Analysis, Financial Breakeven Point & Indifference Level.

Unit –VI

**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 Uncertainly Analysis Dividend – Theories and Determination Mergers and Acquisition – Corporate Restructuring, Value Creation, Merger Negotiations, Leveraged Buyouts, Takeover Portfolio Management – CAPM, APT Derivatives – Options, Option Payoffs, Option Pricing, Forward Contracts & Future Contracts Working Capital Management – Determinants, Cash, Inventory, Receivables and Payables Management, Factoring International Financial Management, Foreign exchange market.

Unit - VII

**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 Strategy Implementation – Challenges of Change, Developing Programs McKinsey 7s Framework Marketing – Concept, Orientation, Trends and Tasks, Customer Value and Satisfaction 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.

Unit –VIII

**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 Logistics and Supply Chain Management, Drivers, Value creation, Supply Chain Design, Designing and Managing Sales Force, Personal Selling Service Marketing – Managing Service Quality and Brands, Marketing Strategies of Service Firms Customer Relationship Marketing – Relationship Building, Strategies, Values and Process Retail Marketing – Recent Trends in India, Types of Retail Outlets. Emerging Trends in Marketing – Concept of e-Marketing, Direct Marketing, Digital Marketing and Green Marketing International Marketing – Entry Mode Decisions, Planning Marketing Mix for International Markets.

Unit –IX

**Statistics for Management:** Concept, Measures Of Central Tendency and Dispersion, Probability Distribution – Binominal, Poison, Normal and Exponential Data Collection & Questionnaire Design Sampling – Concept, Process and Techniques Hypothesis Testing – Procedure; T, Z, F, Chi-square tests Correlation and Regression Analysis Operations Management – Role and Scope Facility Location and Layout – Site Selection and Analysis, Layout – Design and Process Enterprise Resource Planning – ERP Modules, ERP implementation Scheduling; Loading, Sequencing and Monitoring Quality Management and Statistical Quality Control, Quality Circles, Total Quality Management – KAIZEN, Benchmarking, Six Sigma; ISO 9000 Series Standards Operation Research – Transportation, Queuing Decision Theory, PERT / CPM.

Unit –X

**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 International Trade Procedures and Documentation; EXIM Policies Role of International Financial Institutions – IMF and World Bank Information Technology – Use of Computers in Management Applications; MIS, DSS Artificial Intelligence and Big Data Warehousing, Data Mining and Knowledge Management – Concepts Managing Technological Change

Unit – XI

**Entrepreneurship Development**: Concept, Types, Theories and Process, Developing Entrepreneurial Competencies Intrapreneurship – Concept and Process Women Entrepreneurship and Rural Entrepreneurship 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 Micro and Small Scale Industries in India; Role of Government in Promoting SSI Sickness in Small Industries – Reasons and Rehabilitation Institutional Finance to Small Industries – Financial Institutions, Commercial Banks, Cooperative Banks, Micro Finance.

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## MATHEMATICS

## UNIT – 1

**Analysis:** Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum.

Sequences and series, convergence, limsup, liminf.

Bolzano Weierstrass theorem, Heine Borel theorem.

Continuity, uniform continuity, differentiability, mean value theorem.

Sequences and series of functions, uniform convergence.

Riemann sums and Riemann integral, Improper Integrals.

Monotonic functions, types of discontinuity, functions of bounded variation, Lebesgue measure, Lebesgue integral.

Functions of several variables, directional derivative, partial derivative, derivative as a linear transformation, inverse and implicit function theorems.

Metric spaces, compactness, connectedness. Normed linear Spaces. Spaces of continuous functions as examples.

**Linear Algebra:** Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations.

Algebra of matrices, rank and determinant of matrices, linear equations.

Eigenvalues and eigenvectors, Cayley-Hamilton theorem.

Matrix representation of linear transformations. Change of basis, canonical forms, diagonal forms, triangular forms, Jordan forms.

Inner product spaces, orthonormal basis.

Quadratic forms, reduction, and classification of quadratic forms

## UNIT – 2

**Complex Analysis:** Algebra of complex numbers, the complex plane, polynomials, power series, transcendental functions such as exponential, trigonometric, and hyperbolic functions. Analytic functions, Cauchy-Riemann equations.
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.

**Algebra:** Permutations, combinations, pigeon-hole principle, inclusion-exclusion principle, derangements.

Fundamental theorem of arithmetic, divisibility in Z, congruences, Chinese Remainder Theorem, Euler's Ø- function, primitive roots.

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.

Fields, finite fields, field extensions, Galois Theory.

**Topology**: basis, dense sets, subspace and product topology, separation axioms, connectedness, and compactness.

## UNIT – 3

**Ordinary Differential Equations (ODEs):**

Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs.

General theory of homogeneous and non-homogeneous linear ODEs, variation of parameters, Sturm-Liouville boundary value problem, Green's function.

**Partial Differential Equations (PDEs):**

Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs.

Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations.

**Numerical Analysis:**

Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods, Finite differences, Lagrange, Hermite and spline interpolation, Numerical differentiation and integration, Numerical solutions of ODEs using Picard, Euler, modified Euler and
Runge-Kutta methods.

**Calculus of Variations:**

Variation of a functional, 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:**

Generalized coordinates, Lagrange's equations, Hamilton's canonical equations, Hamilton's principle and principle of least action, Two-dimensional motion of rigid bodies, Euler's dynamical equations for the motion of a rigid body about an axis, theory of small oscillations.

## UNIT – 4

Descriptive statistics, exploratory data analysis

Sample space, discrete probability, independent events, Bayes theorem. Random variables and distribution functions (univariate and multivariate); expectation and moments. Independent random variables, marginal and conditional distributions. Characteristic functions. Probability inequalities (Tchebyshef, Markov, Jensen). Modes of convergence, weak and strong laws of large numbers, Central Limit theorems (i.i.d. case).
Markov chains with finite and countable state space, classification of states, limiting behaviour of n-step transition probabilities, stationary distribution, Poisson, and birth-and-death processes.

Standard discrete and continuous univariate distributions. sampling distributions, standard errors and asymptotic distributions, distribution of order statistics and range.

Methods of estimation, properties of estimators, confidence intervals. Tests of hypotheses: most powerful and uniformly most powerful tests, likelihood ratio tests. Analysis of discrete data and chi-square test of goodness of fit. Large sample tests.

Simple nonparametric tests for one and two sample problems, rank correlation and test for independence. Elementary Bayesian inference.

Gauss-Markov models, estimability of parameters, best linear unbiased estimators, confidence intervals, tests for linear hypotheses. Analysis of variance and covariance. Fixed, random and mixed effects models. Simple and multiple linear regression. Elementary regression diagnostics. Logistic regression.

Multivariate normal distribution, Wishart distribution and their properties. Distribution of quadratic forms. Inference for parameters, partial and multiple correlation coefficients, and related tests. Data reduction techniques: Principle component analysis, Discriminant analysis, Cluster analysis, Canonical correlation.
Simple random sampling, stratified sampling and systematic sampling. Probability proportional to size sampling. Ratio and regression methods.

Completely randomized designs, randomized block designs and Latin-square designs. Connectedness and orthogonality of block designs, BIBD. $2^K$ factorial experiments: confounding and construction.

Hazard function and failure rates, censoring and life testing, series and parallel systems.

Linear programming problem, simplex methods, duality. Elementary queuing and inventory models. Steady-state solutions of Markovian queuing models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited waiting space, M/G/1.

# Syllabus of Written Examination for the Faculty Recruitment (Assistant Professor on Contract)

## PHYSICS

### 1. Mathematical Methods of Physics

Dimensional analysis. Vector algebra and vector calculus. Linear algebra, matrices, Cayley-Hamilton Theorem. Eigenvalues and eigenvectors. Linear ordinary differential equations of first & second order, Special functions (Hermite, Bessel, Laguerre and Legendre functions). Fourier series, Fourier and Laplace transforms. Elements of complex analysis, analytic functions; Taylor & Laurent series; poles, residues and evaluation of integrals. Elementary probability theory, random variables, binomial, Poisson and normal distributions. Central limit theorem.

### 2. Classical Mechanics

Newton's laws. Dynamical systems, Phase space dynamics, stability analysis. Central force motions. Two body Collisions - scattering in laboratory and Centre of mass frames. Rigid body dynamics- moment of inertia tensor. Non-inertial frames and pseudoforces. Variational principle. Generalized coordinates. Lagrangian and Hainiltonian formalism and equations of motion. Conservation laws and cyclic coordinates. Periodic motion: small oscillations, normal modes. Special theory of relativity- Lorentz transformations, relativistic kinematics and mass—energy equivalence.

### 3. Electromagnetic Theory

Electrostatics: Gauss's law and its applications, Laplace and Poisson equations, boundary value problems. Magnetostatics: Biot-Savart law, Ampere's theorem. Electromagnetic induction. Maxwell's equations in free space and linear isotropic media; boundary conditions on the fields at interfaces. Scalar and vector potentials, gauge invariance. Electromagnetic waves in free space. Dielectrics and conductors. Reflection and refraction, polarization, Fresnel's law, interference, coherence, and diffraction. Dynamics of charged particles in static and uniform electromagnetic fields.

### 4. Quantum Mechanics

Wave-particle duality. Schrödinger equation (time-dependent and time-independent). Eigenvalue problems (particle in a box, harmonic oscillator, etc.). Tunneling through a barrier. Wave-function in coordinate and momentum representations. Commutators and Heisenberg uncertainty principle. Dirac notation for state vectors. Motion in a central potential: orbital angular momentum, angular momentum algebra, spin, addition of angular momenta; Hydrogen atom. Stern-Gerlach experiment. Time-independent perturbation theory and applications. Variational method. Time dependent perturbation theory and Fermi's golden rule, selection rules. Identical particles, Pauli exclusion principle, spin-statistics connection.

### 5. Thermodynamic and Statistical Physics

Laws of thermodynamics and their consequences. Thermodynamic potentials, Maxwell relations, chemical potential, phase equilibria. Phase space, micro- and macro-states. Micro-canonical, canonical

and grand-canonical ensembles and partition functions. Free energy and its connection with thermodynamic quantities. Classical and quantum statistics. Ideal Bose and Fermi gases. Principle of detailed balance. Blackbody radiation and Planck's distribution law.

**6. Electronics and Experimental Methods**

Semiconductor devices (diodes, junctions, transistors, field effect devices, homo- and hetero-junction devices), device structure, device characteristics, frequency dependence and applications. Opto-electronic devices (solar cells, photo-detectors, LEDs). Operational amplifiers and their applications. Digital techniques and applications (registers, counters, comparators and similar circuits). A/D and D/A converters. Microprocessor and microcontroller basics.

Data interpretation and analysis. Precision and accuracy. Error analysis, propagation of errors. Least squares fitting,

**7. Mathematical Methods of Physics**

Green's function. Partial differential equations (Laplace, wave and heat equations in two and three dimensions). Elements of computational techniques: root of functions, interpolation, extrapolation, integration by trapezoid and Simpson's rule, Solution of first order differential equation using Runge-Kutta method. Finite difference methods. Tensors. Introductory group theory: SU(2), O(3).

**8. Classical Mechanics**

Dynamical systems, Phase space dynamics, stability analysis. Poisson brackets and canonical transformations. Symmetry, invariance and Noether's theorem. Hamilton-Jacobi theory.

**9. Electromagnetic Theory**

Dispersion relations in plasma. Lorentz invariance of Maxwell's equation. Transmission lines and wave guides. Radiation- from moving charges and dipoles and retarded potentials.

**10. Quantum Mechanics**

Spin-orbit coupling, fine structure. WKB approximation. Elementary theory of scattering: phase shifts, partial waves, Born approximation. Relativistic quantum mechanics: Klein-Gordon and Dirac equations. Semi-classical theory of radiation.

**11. Thermodynamic and Statistical Physics**

First- and second-order phase transitions. Diamagnetism, paramagnetism, and ferromagnetism. Ising model. Bose-Einstein condensation. Diffusion equation. Random walk and Brownian motion. Introduction to nonequilibrium processes.

**12. Electronics and Experimental Methods**

Linear and nonlinear curve fitting, chi-square test. Transducers (temperature, pressure/vacuum, magnetic fields, vibration, optical, and particle detectors). Measurement and control. Signal conditioning and recovery. Impedance matching, amplification (Op-amp based, instrumentation amp, feedback), filtering

and noise reduction, shielding and grounding. Fourier transforms, lock-in detector, box-car integrator, modulation techniques.

High frequency devices (including generators and detectors).

**13. Atomic & Molecular Physics**

Quantum states of an electron in an atom. Electron spin. Spectrum of helium and alkali atom. Relativistic corrections for energy levels of hydrogen atom, hyperfme structure and isotopic shift, width of spectrum lines, LS & JJ couplings. Zeeman, Paschen-Bach & Stark effects. Electron spin resonance. Nuclear magnetic resonance, chemical shift. Frank-Condon principle. Born-Oppenheimer approximation. Electronic, rotational, vibrational and Raman spectra of diatomic molecules, selection rules. Lasers: spontaneous and stimulated emission, Einstein A & B coefficients. Optical pumping, population inversion, rate equation. Modes of resonators and coherence length.

**14. Condensed Matter Physics**

Bravais lattices. Reciprocal lattice. Diffraction and the structure factor. Bonding of solids. Elastic properties, phonons, lattice specific heat. Free electron theory and electronic specific heat. Response and relaxation phenomena. Drude model of electrical and thermal conductivity. Hall effect and thermoelectric power. Electron motion in a periodic potential, band theory of solids: metals, insulators and semiconductors. Superconductivity: type-I and type-II superconductors. Josephson junctions. Superfluidity. Defects and dislocations. Ordered phases of matter: translational and orientational order, kinds of liquid crystalline order. Quasi crystals.

**15. Nuclear and Particle Physics**

Basic nuclear properties: size, shape and charge distribution, spin and parity. Binding energy, semi-empirical mass formula, liquid drop model. Nature of the nuclear force, form of nucleon-nucleon potential, charge-independence and charge-symmetry of nuclear forces. Deuteron problem. Evidence of shell structure, single-particle shell model, its validity and limitations. Rotational spectra. Elementary ideas of alpha, beta and gamma decays and their selection rules. Fission and fusion. Nuclear reactions, reaction mechanism, compound nuclei and direct reactions.

Classification of fundamental forces. Elementary particles and their quantum numbers (charge, spin, parity, isospin, strangeness, etc.). Gellmann-Nishijima formula. Quark model, baryons and mesons. C, P, and T invariance. Application of symmetry arguments to particle reactions. Parity non-conservation in weak interaction. Relativistic kinematics.

# Syllabus of Written Examination for the Faculty Recruitment (Assistant Professor on Contract)

**Department of Humanities & Social Sciences (Psychology)**

**Unit-1 Emergence of Psychology**

Psychological thought in some major Eastern Systems: Bhagavad Gita, Buddhism, Sufism and Integral Yoga. Academic psychology in India: Pre- independence era; post-independence era; Western: Greek heritage, medieval period and modern period. Structuralism, Functionalism, Psychoanalytical, Gestalt, Behaviorism, Humanistic Existential, Transpersonal, Cognitive revolution, Multiculturalism; Four founding paths of academic psychology - Wundt, Freud, James, Dilthey; Issues: Crisis in psychology due to strict adherence to experimental/analytical paradigm (logical empiricism); Indic influences on modern psychology. Essential aspects of knowledge paradigms: Ontology, epistemology, and methodology; Paradigms of Western Psychology: Positivism, Post-Positivism, Critical perspective, Social Constructionism, Existential Phenomenology, and Co-operative Enquiry; Significant Indian paradigms on psychological knowledge: Yoga, Bhagavad Gita, Buddhism, Sufism, and Integral Yoga.

**Unit-2 Research Methodology and Statistics**

Research: Meaning, Purpose, and Dimensions; Research problems, Variables and Operational Definitions, Hypothesis, Sampling; Ethics in conducting and reporting research; Paradigms of research: Quantitative, Qualitative, Mixed methods approach; Methods of research: Observation, Survey [Interview, Questionnaires], Experimental, Quasi-experimental, Field studies, Cross-Cultural Studies, Phenomenology, Grounded theory, Focus groups, Narratives, Case studies, Ethnography; Statistics in Psychology: Measures of Central Tendency and Dispersion; Normal Probability Curve. Parametric [t-test] and Non-parametric tests [SignTest, Wilcoxon Signed rank test, Mann-Whitney test, Kruskal-Wallis test, Friedman]; Power analysis. Effect size; Correlational Analysis: Correlation [Product Moment, Rank Order], Partial correlation, multiple correlation; Special Correlation Methods: Biserial, Point biserial, tetrachoric, phi coefficient; Regression: Simple linear regression, Multiple regression. Factor analysis: Assumptions, Methods, Rotation and Interpretation. Experimental Designs: ANOVA [One-way, Factorial], Randomized Block Designs, Repeated Measures Design, Latin Square, Cohort studies, Time series, MANOVA, ANCOVA. Single-subject designs.

**Unit-3 Psychological Testing**

Types of tests; Test construction: Item writing, item analysis; Test standardization: Reliability, validity and Norms; Areas of testing: Intelligence, creativity, neuropsychological tests, aptitude, Personality assessment, interest inventories; Attitude scales – Semantic differential, Staples, Likert scale; Computer-based psychological testing; Applications of psychological testing in various settings: Clinical, Organizational and business, Education, Counseling, Military and Career guidance.

**Unit-4 Biological Bases of Behavior**

Sensory systems: General and specific sensations, receptors and processes; Neurons: Structure, functions, types, neural impulse, synaptic transmission; Neurotransmitters; The Central and Peripheral Nervous Systems – Structure and functions; Neuroplasticity; Methods of Physiological Psychology: Invasive methods – Anatomical methods, degeneration techniques, lesion techniques, chemical methods, microelectrode studies; Non-invasive

methods – EEG, Scanning methods; Muscular and Glandular system: Types and functions; Biological basis of Motivation: Hunger, Thirst, Sleep and Sex; Biological basis of emotion: The Limbic system, Hormonal regulation of behavior; Genetics and behavior: Chromosomal anomalies; Nature-Nurture controversy [Twin studies and adoption studies]

**Unit-5 Attention, Perception, Learning, Memory and Forgetting**

Attention: Forms of attention, Models of attention; Perception: Approaches to the Study of Perception: Gestalt and physiological approaches; Perceptual Organization: Gestalt, Figure and Ground, Law of Organization; Perceptual Constancy: Size, Shape, and Color; Illusions; Perception of Form, Depth and Movement; Role of motivation and learning in perception; Signal detection theory: Assumptions and applications; Subliminal perception and related factors, information processing approach to perception, culture and perception, perceptual styles, Pattern recognition, Ecological perspective on perception. Learning Process: Fundamental theories: Thorndike, Guthrie, Hull; Classical Conditioning: Procedure, phenomena and related issues; Instrumental learning: Phenomena, Paradigms and theoretical issues; Reinforcement: Basic variables and schedules; Behaviour modification and its applications; Cognitive approaches in learning: Latent learning, observational learning; Verbal learning and Discrimination learning; Recent trends in learning: Neurophysiology of learning; Memory and Forgetting; Memory processes: Encoding, Storage, Retrieval, Stages of memory: Sensory memory, Short-term memory (Working memory), Long-term Memory (Declarative -Episodic and Semantic; Procedural); Theories of Forgetting: Interference, Retrieval Failure, Decay, Motivated forgetting

**Unit-6 Thinking, Intelligence and Creativity**

Theoretical perspectives on thought processes: Associationism, Gestalt, Information processing, Feature integration model; Concept formation: Rules, Types, and Strategies; Role of concepts in thinking; Types of Reasoning; Language and thought; Problem solving: Type, Strategies, and Obstacles; Decision-making: Types and models; Metacognition: Metacognitive knowledge and Metacognitive regulation; Intelligence: Spearman; Thurstone; Jensen; Cattell; Gardner; Stenberg; Goleman; Das, Kar & Parrila Creativity: Torrance, Getzels & Jackson, Guilford, Wallach & Kogan; Relationship between Intelligence and Creativity.

**Unit-7 Personality, Motivation, Emotion, Stress and Coping**

Determinants of personality: Biological and socio-cultural; Approaches to the study of personality: Psychoanalytical, Neo-Freudian, Social learning, Trait and Type, Cognitive, Humanistic, Existential, Transpersonal psychology; Other theories: Rotter's Locus of Control, Seligman's Explanatory styles, Kohlberg’s theory of Moral development; Basic motivational concepts: Instincts, Needs, Drives, Arousal, Incentives, Motivational Cycle; Approaches to the study of motivation: Psychoanalytical, Ethological, S-R, Cognitive, Humanistic; Exploratory behavior and curiosity; Zuckerman's Sensation seeking; Achievement, Affiliation and Power; Motivational Competence; Self-regulation; Flow; Emotions: Physiological correlates; Theories of emotions: James-Lange, Canon-Bard; Schachter and Singer; Lazarus, Lindsley; Emotion regulation; Conflicts: Sources and types; Stress and Coping: Concept, Models, Type A, B, C, D behaviors, Stress management strategies [Biofeedback, Music therapy, Breathing exercises, Progressive Muscular Relaxation, Guided Imagery, Mindfulness, Meditation, Yogasana, Stress Inoculation Training].

**Unit-8 Social Psychology**

Nature, scope and history of social psychology; Traditional theoretical perspectives: Field theory, Cognitive Dissonance, Sociobiology, Psychodynamic Approaches, Social Cognition; Social perception [Communication, Attributions]; attitude and its change within cultural

context; prosocial behavior; Group and Social influence [Social Facilitation; Social loafing]; Social influence [Conformity, Peer Pressure, Persuasion, Compliance, Obedience, Social Power, Reactance]; Aggression; Group dynamics, leadership style and effectiveness. Theories of intergroup relations [Minimal Group Experiment and Social Identity Theory, Relative Deprivation Theory, Realistic Conflict
Theory, Balance Theories, Equity Theory, Social Exchange Theory]; Applied social psychology: Health, Environment and Law; Personal space, crowding, and territoriality.

**Unit-9 Human Development and Interventions**

Developmental processes: Nature, Principles, Factors in development, Stages of Development; Successful aging; Theories of development: Psychoanalytical, Behavioristic, and Cognitive; various aspects of development: Sensory-motor, cognitive, language, emotional, social and moral; Psychopathology: Concept, Mental Status Examination, Classification, Causes; Psychotherapies: Psychoanalysis, Person-centered, Gestalt, Existential, Acceptance Commitment Therapy, Behavior therapy, REBT, CBT, MBCT, Play therapy, Positive psychotherapy, Transactional Analysis, Dialectic behavior therapy, Art therapy, Performing Art Therapy, Family therapy; Applications of theories of motivation and learning in School; Factors in educational achievement; Teacher effectiveness Guidance in schools: Needs, organizational set up and techniques; Counseling: Process, skills, and techniques

**Unit-10 Organizational Behavior**

Meaning and development of OB, Concept and significance of OB, Need for Organizational Behavior, Contributing disciplines, Challenge and opportunities for OB, Models of OB; Motivation: Meaning, Types and Theories (Content and Process theories); Learning: Concept and Characteristics, Principles, models of learning, Brief Idea of Components of Learning Process; Attitudes: Concept and Characteristics, Factors, and Measures of Changing Attitudes; Perception: Components, factors influencing perception process; Personality: Determinants, theories, measurement; Leadership: meaning, style, models of leadership, Organizational Culture; Organizational Change and development; Group formation, Group Cohesiveness and development, inter-group conflict, Nature, process and resolution techniques; the nature and types of team, creating effective team, dysfunctions of group and team, Communication process, meaning, barriers and methods to overcome barriers.

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# Syllabus of Written Examination for the Faculty Recruitment
# (Assistant Professor on Contract)
## Information Technology

- Digital Logic: Boolean algebra Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).
- Computer Organization and Architecture: 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 interface (interrupt and DMA mode).
- Programming and Data Structures: Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.
- Algorithms: 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
- Theory of Computation: Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.
- Compiler Design: Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation. Local optimization, Data flow analyses: constant propagation, liveness analysis, common sub expression elimination.
- Operating System: System calls, processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU and I/O scheduling. Memory management and virtual memory. File systems.
- Databases: 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.
- 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, IPv4, 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.