आई सी एम आर – राष्ट्रीय यक्ष्मा अनुसंधान संस्थान
स्वास्थ्य अनुसंधान विभाग, स्वास्थ्य और परिवार
कल्याण मंत्रालय, भारत सरकार
ICMR - National Institute for Research in Tuberculosis
Department of Health Research, Ministry of Health
and Family Welfare, Government of India

No.ICMR-NIRT/Tech.Recruit/01/2023/ Date: 15.11.2023

SUBJECT SYLLABUS FOR COMPUTER-BASED TEST

With reference to the notification issued by ICMR-NIRT for filling up of technical posts under various disciplines vide notification No.ICMR-NIRT/Tech.Recruit/01/2023 dated 26.09.2023, the indicative Subject Syllabus for Computer-Based Test is as follows:

Post Code: TA-01
Discipline: Microbiology/ Biotechnology/ Medical Lab Technology

History of Microbiology
Morphology and physiology of Bacteria
Sterilization and disinfectant
Culture media
Culture methods
Laboratory identification of bacteria and taxonomy
Bacterial genetics
Genetics engineering
Molecular biology of microorganism
Molecular biology techniques
Antimicrobial therapy and resistance
Microbial pathogenesis
Laboratory diagnosis of bacterial infection
Vaccines
Types of immunity
Antigens
Antibodies
Antigen antibody reaction
Complement system
Structure and function of immune system
Cell mediated Immune response
Humoral Immune response
Immunodeficiency
Hypersensitivity
Autoimmunity
Transplantation immunology
Cancer immunology
Antimicrobial immunity
Immunohematology
Techniques in immunology
ELISA
Western blot
Flow cytometry

Biology and pathogenesis of Mycobacterium tuberculosis and treatment
Biology and Pathogenesis of medically important bacteria and treatment
General properties of virus
Pathogenesis of viral infection
Antiviral agents & mechanism of their action
Viral drug resistance
Laboratory diagnosis of viral infection
Bacteriophages
Medically important virus pathogenesis and treatment
Medical mycology
Biology and treatment of opportunistic infection
Hospital acquired infections
Microbiology of Air, water and soil
Biomedical waste management
Immune prophylaxes
Carbohydrate metabolism
Lipid metabolism
Nucleic acid metabolism
Trace elements in health and disease
Biology and function of vitamins
Genomics
Proteomics
DNA biology and replication
RNA biology and transcription
Protein biology and translation
Sanger Sequencing and NGS
Nutritional biochemistry

Post Code: TA-02
Discipline: Biochemistry/Clinical Pharmacology

Biological Sciences:
Introduction to plant and animal sciences
Structure and function of plant tissues
Nutrition and transport in plants
Structure and function of animal tissues
Nutrition and transport in animals
Homeostasis
Basic concept of developmental biology
Coordination and control of plants and animals
Evolution
Cell Biology:
Introduction to cell biology
Cell wall and cell membrane
Cell organelles
The nucleus
Microscopy
Biomolecules:
Carbohydrates
Proteins and amino acids
Lipids
Nucleic acids
Vitamins and minerals
Chemistry:
Basic concept of organic, inorganic and physical chemistry

Chemical bond and forces
Chemistry of biomolecules, drugs and functions
Intermediary metabolism:
Enzymes & enzyme kinetics
Macromolecule and heme metabolism
Oxidative phosphorylation and electron transport
Integration of metabolism
Biological role of minerals
Human physiology and nutrition:
Respiratory system, Cardiovascular system, muscle & nerve physiology, Excretory system, Nutrition and energy supply
Introduction to nutrition, Energy in human nutrition, Concepts of calorie, basic food groups and study of different foods, energy requirements
Basic microbiology
Analytical biochemistry
Clinical biochemistry
Molecular biology
Basic endocrinology
Basic immunology
Basic biotechnology
Basic genetics
Lifestyle disorder
Biochemical pharmacology
Environmental biology
Biophysics
Bioinstrumentation
Biophysical and Biochemical techniques
Human physiology and nutritional biochemistry
Medical lab technology
Biotechnology
Diagnostic biochemistry
Biostatistics
Bioinformatics
Fundamentals of computers/Computer application in biology

Post Code: TA-03
Discipline: Bio-Informatics

Central Dogma of Molecular Biology
Prokaryotic and Eukaryotic Genome organization
Genomics, Proteomics and Transcriptomics
Next Generation Sequencing
Biological databases and Biological Data types
Applications of Bioinformatics
Bioinformatics tools and software
Sequence Analysis
Biomolecules
Structural Bioinformatics, Molecular docking and Dynamics simulation
Drug Discovery
Systems Biology
Basics of computer operating systems and networking
Linux and shell scripting
Python programming

Post Code: TA-04
Discipline: Biomedical Engineer / Instrumentation Engineer

Anatomy and Human physiology – Basic structure and function of cell, Basics of anatomy and physiology of various systems of human body.
Pathology and Microbiology - Analyze structural and functional aspects of living organisms, Describe methods involved in treating the pathological diseases. Study about microscopy.
Medical Physics - non-ionizing radiation, interaction with tissue and its effects, Summarizes how ionizing radiation interacts with the human body, how to quantify it and its levels seen in the environment and healthcare.
Basics of Electrical Engineering - Understand power distribution and hence apply safety principles to biomedical equipment.
Sensors and Measurement - Analyze various electrical parameters with accuracy, precision, resolution, Employ Multimeter, CRO and different types of recorders for appropriate measurement.
Biomedical Instrumentation - analyze the non -electrical and biochemical measurement techniques, basic integrated circuits lab to design preamplifiers for various bio signal acquisition
Diagnostic and Therapeutic Equipment - Functioning and recording setup of all cardiac and neurological equipment, ICU, OT Equipment and Laboratory, hospital related all equipment. Basics of ultrasound and its application.
Radiological Equipment – Working and Functioning of X ray, CR. radiation safety.
Digital Signal Processing - Implement different filters on biomedical signals and analyze its performance, physiological interferences and artifacts affecting ECG signal
Hospital Management system - Explain the principles of Hospital administration. List various marketing research techniques. Understand safety procedures followed in hospitals
Electronic Circuits - Analyze the characteristics of basic electronic devices
Basics of civil ad Mechanical Engineering – Survey of civil materials. Mechanism of Refrigeration and AC
Signals and Systems – Fourier series, Fourier transform, Laplace transform.
Biochemistry - understanding of important biomolecules and their functions, analyze the metabolic pathways in normal and diseased state
Analog and Digital Integrated circuits- To study the application of analog ICs, Digital ICs in the designing circuit.
Microprocessor and controller – Basics of microprocessors, chips and controllers.
Biomechanics – Mechanics of physiological systems, Orthopaedic mechanics.
OOPS and JAVA
Bioinformatics – Machine learning - Neural network, Genetic and fuzzy logic applications in Bio informatics; Modeling for Hidden Markov, Comparative, probabilistic and molecular modeling
Total Quality Management – Principles, Tools and techniques, Quality standards.
Internet programming - WORLD WIDE WEB, HTTP protocol, Web browsers Netscape, Internet explorer
Nano Electronics – Fundamentals of Nano electronics, Carbon nanotubes, Molecular electronics.

Post Code: TA-05
Discipline: Statistics

Basic Statistics
Statistics Definition, Types of Variables and measurements – Quantitative, Qualitative, Semi-Quantitative along with measurement scales, Tabulation for different types of the data along with definition of classification, Graphical representation by types of data for univariate and bivariate presentation, Measures of Central Tendency and Location – Mean, Median, Mode and Measures of Location- Quartiles, Quintiles, Deciles and Percentiles, Measures of Dispersion – Range Deviation, Quartile Deviation etc., Mean Deviation, Variance, Standard Deviation, Coefficient of Variation, Measures of Central Tendency and Variation for Qualitative Variables
Probability Theory
Definition and Concepts in Probability- Classical and Relative Frequency Approach to Probability, Cramer and Kolmogorov's approaches to Probability, Merits and Demerits of these approaches, Random Experiments: Trials, Sampling Units and Sampling Space, Mutually Exclusive and Exhaustive Events.

Discrete Sample Space, Conditional Probability, Bayes' theorem and its applications. Random Variables, Chebyshev's inequality and applications, Statements and Applications of Weak Law of Large Numbers and Central Limit Theorems

Theoretical Probability Distributions

Normal Distribution, Binominal Distribution, Poisson Distribution, Negative Binominal, and Basic Statistics

Statistics Definition, Types of Variables and measurements – Quantitative, Qualitative, Semi-Quantitative along with measurement scales, Tabulation for different types of the data along with definition of classification, Graphical representation by types of data for univariate and bivariate presentation, Measures of Central Tendency and Location – Mean, Median, Mode and Measures of Location- Quartiles, Quintiles, Deciles and Percentiles, Measures of Dispersion – Range Deviation, Quartile Deviation etc., Mean Deviation, Variance, Standard Deviation, Coefficient of Variation, Measures of Central Tendency and Variation for Qualitative Variables

Probability Theory

Definition and Concepts in Probability- Classical and Relative Frequency Approach to Probability, Cramer and Kolmogorov's approaches to Probability, Merits and Demerits of these approaches, Random Experiments: Trials, Sampling Units and Sampling Space, Mutually Exclusive and Exhaustive Events.

Discrete Sample Space, Conditional Probability, Bayes' theorem and its applications. Random Variables, Chebyshev's inequality and applications, Statements and Applications of Weak Law of Large Numbers and Central Limit Theorems

Theoretical Probability Distributions

Normal Distribution, Binominal Distribution, Poisson Distribution, Negative Binominal, and Geometric Distribution along with their properties and utility in Descriptive and Inferential Statistics.

Sampling Techniques and Design

Concepts of Sampling and Non Sampling Errors, Population and Sample, Simple Random Sampling, Stratified Sampling, Systematic Sampling, Cluster Sampling, Multistage Sampling, Multiphase Sampling, Quota Sampling, Inverse Sampling along with Sample Size Estimation for all Sampling Techniques

Statistical Inference

Concept of a Statistic and Sampling Distribution, Point and Interval Estimate of a Parameter, Standard errors, Null and Alternative Hypotheses, Statistical Tests and Distributions, Conceptsof Type I & II Errors, p- values, Chi-square tests, t – test, Z-test and F-test.

Design of Experiments

Process of Randomization, Analysis of Variance (one/ two way), Analysis of covariance Randomized Block Design, Latin Square Designs (Cross-over Designs), Factorial Designs

Correlation and Multivariate Regression Analysis

Correlation Coefficient, Partial and Multiple Correlation Coefficients, Coefficient of Determination, Correlation ratio, Methods of Regression Models in Regression - Least Squares, Maximum Likelihood, Fitting of Linear Regression and related results, Appropriate Polynomials Models (Curve fittings), Logistic Regression Analysis.

Non-parametric tests

Definition of Order Statistics and their distributions, Non-parametric tests; Chi square (test, Goodness of Fit, Independence), Fisher's exact test, McNemar test, Sign test for univariate and Bivariate Distributions, Wilcoxon-Mann-Whitney test, Run test, Median test and Spearman's Rank Correlation test. Friedman's two way ANOVA and Concordance, Cochran Q test, Kruskal-Wallis test

Basic Demography

Censuses in India and World, Age and Sex Composition, Data Appraisal and adjustments, SexRatio, Dependency Ratio, Population Theories, Demographic Transition.

Registration Systems and Sample Surveys

Vital Events and Registration, Population and Health surveys – Civil Registration System (CRS),Sample Registration System (SRS), National Sample Survey (NSS), National Family Health Survey (NFHS), District Level Health Surveys (DLHS), Reproductive and Child Health Survey (RCHS) – Nature and limitation of data.

Health and Mortality

Concepts and definition of Health & Disease, International Classification of Disease and Mortality, Disease Burden, Disability and Rehabilitation, Prevalence and Incidence Rates, Direct and Indirect

Adjustment of Mortality Rates, Concepts of Disability Adjusted Life Years (DALY), Measures of Mortality, Life Tables – Abridged and complete and their measures, Kaplan Meier Survival Method
Basic Epidemiology
Health and Disease Concepts, Approaches in Epidemiology – General Epidemiology and Clinical Epidemiology, Rates, Ratios and Proportion, Prevalence, Incidence, Attributable Risk, Relative Risk, Odds Ratio, Risk Ratio

Post Code: TA-06
Discipline: Computer Programming

Relational Database Management System: Relational Algebra– Tuple and Domain Relational Calculus – SQL – Views – Triggers – Domain Constraints – Referential Integrity.
Normalization: Functional Dependencies – Inference rules – Decomposition – Properties – Normal Forms (NF) – First NF, Second NF, Third NF, Boyce-Codd NF, Fourth NF, and Fifth NF.
Sorting and Indexing:
Data Mining: Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: - Efficient and Scalable Frequent Item Set Mining Methods – Mining Various Kinds of Association Rules – from Association Mining to Correlation Analysis – Constraint-Based Association Mining.
GIS: Definition -History of GIS -Basic Components of GIS – Hardware, Software, Spatial Data, Non-spatial data, Scaling, Open-Source software.
Functions in C++: Function Prototype - Arguments passing - Return type - Default arguments - Inline functions– Function overloading - Operator function - Operator overloading - Template functions.
Inheritance in C++: Derived class - Single Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance - Virtual Functions - Virtual Base class - Nesting of classes.
Markup and Scripting Languages: Introduction to HTML – Attributes, Events, Web forms, SVG, Audio and Video – DHTML – Client-Side Scripting −JavaScript – Cascading style sheets –XML – DTD – XML Schema – DOM – SAX –XSL−AJAX−JSON.
Web Application Development: HTML, PHP, Java, JavaScript, Perl, Python
Android: Overview – Features - activities - services - content providers - broadcast receivers.
Information Security: Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.
Testing Automation Tools: Building and testing.
R language
Machine learning process
AI tools
Internet of Things

Post Code: TA-07
Discipline: Electrical

DC Circuits
AC Circuits
Transformers
Electrical Machines
Electromagnetic Fields
Electronic Devices and Circuits
Power Electronics
Measurements and Instrumentation
Transmission and Distribution
Control Systems
Electrical Machine Design
Power System Engineering
Power System Protection and Switch Gear

High Voltage Engineering
FACTS
HVDC and AC Transmission
Power Quality
Energy Engineering
Renewable Energy Systems
Electric and Hybrid Vehicles

Post Code: TA-08
Discipline: Health Economics

Micro Economics: Theory of Consumer Behaviour; Theory of Production and Costs; Decision making under uncertainty Attitude towards Risk; Market Structures; competitive and non-competitive equilibria and their efficiency properties; Factors of Pricing; General Equilibrium Analysis; Efficiency Criteria (Pareto-Optimality, Kaldor–Hicks and Wealth Maximization) and Welfare Economics (Fundamental Theorems, Social Welfare Function).
Macro Economics: Concepts and Measurement of macroeconomic indicators; Determination of output; Consumption Function; Investment Function; Multiplier and Accelerator; Demand for Money; Supply of Money; Inflation; Business Cycles; Monetary and Fiscal Policy.
Statistics and Econometrics: Basic Concepts; Probability Theory; Descriptive Statistics; Statistical Inferences, Hypothesis testing; Regression Models and their properties; Simultaneous Equation Models and Time Series Analysis; Differential Calculus and its Applications; Optimization Problems and their applications; Input-Output Model, Linear Programming; and Differential equations with applications.
Public Economics: Market Failure and Remedial Measures; Public Goods, Externality; Regulation of Market; Public Revenue; Public expenditure; Public Budget and Budget impact analysis.
Development Economics: Economic Growth and Economic Development; Theories of Economic Development; Models of Economic Growth; Indicators of Economic Development; Poverty and Inequalities (Concepts and Measurement) and Social Sector Development (Health and Education)
Health Economics: Main concepts; Economic Evaluation in Health Care; Estimation of short run and long run cost, average and marginal costs, private and social costs; Empirical microeconomic models; Health dimensions of development; Health policy and management; Healthcare markets; Health indicators, effectiveness indicators and Methods of Calculation.

Post Code: TA-09
Discipline: Mechanic

Operations of petrol/diesel engines
Checking of faults and mechanical repairs
Repair & Maintenance of engine
Repair & Maintenance of fuel system
Repair & Maintenance of all tyres
Repair & Maintenance of brake system
Repair & Maintenance of clutch system
Repair & Maintenance of chassis
Vehicle Registration works
Maintenance of Vehicle Records, RC Book, Insurance, Tax, Fitness, Fuel Records and Workshop tools/equipments

Post Code: TA-10
Discipline: Network Administration

Linux and Windows Operating System: Design Principles – Kernel Modules – Scheduling – Memory Management – File Systems – Inter Process Communication - Security – Windows – Design Principles – System Component – File system.
VLAN, VPN, Active directory, LDAP.

MAC Layer: Framing - ALOHA Protocols – CSMA/CD – FDMA – TDMA – CDMA –Addressing - LANs: Ethernet, Token Ring, FDDI – SONET/SDH – ATM - Error Detection and Correction – Sliding Window Protocols.
Fundamentals of Networking: History and development of Computer Networks – Network Topologies – Protocol Layers and Service Models – OSI - Internetworking and Routing – Transmission Media – Analog Transmission – Digital Transmission – Multiplexing –Switching.
Network Layer: Logical Addressing: IPv4, IPv6, IPv4 to IPv6 Address Mapping, CIDR – Inter connection of LANs: Hubs, Switches, Repeaters, Bridges, Routers, Spanning Tree, Flooding & Multicasting – Layer 3 Protocols: IP, ARP, RARP, ICMP, IGMP – Inter Domain and Intra Domain Routing.
Network Management Applications: Configuration management, Fault management, performance management, Event Correlation Techniques Security Management, Accounting management, Report Management, Policy Based Management Service Level Management- Network Management Tools, Network Statistics Measurement Systems – Web Based Management, XML Based Network Management.
OSI Network Management: OSI Network management model-Organizational Model-Information model - communication model - Abstract Syntax Notation - Encoding structure - Macros Functional model CMIP/CMIS.
Network Security: TCP/IP and OSI - Pretty good privacy – S/MIME-IP Security Overview – Wireless Security and SSL.
Firewalls: Elements of firewall design - types of security threats - responses to security attacks - best practices to design, implement, and monitor a network security plan.
Cloud Architecture: Three-layer cloud computing architecture - On-demand provisioning - Elasticity in cloud Computing Services – Infrastructure-as-a-Service – Software-as-a-Service –Platform-as-a-Service - Cloud providers - Cloud deployment models.
Issues in Cloud: Federation in cloud - Four levels of federation - Privacy in cloud - Security in cloud - Software-as-a-Service security, Disaster recovery.
Public Key Cryptography & Digital Signatures: RSA algorithm – Diffie - Hellman key exchange-Digital Signature – Authentication protocols- Digital Signature.
Message Authentication: Mac Functions, Hash Functions – Authentication requirements – authentication functions – Authentication Mechanisms.

Post Code: TA-11
Discipline: Pharmacy

Pharmaceutics
Chemistry
Pharmacognosy
Anatomy
Physiology
Pharmacology
Forensic pharmacy

Post Code: TA-12
Discipline: Psychology

Cognitive Psychology
Foundation of Social Psychology
Foundations of Developmental Psychology
Foundations of Organizational Psychology
Fundamentals of Clinical Psychology
Fundamentals of Counselling
Introduction to Bio-psychology
Introduction to Indian Psychological Thought
Introduction to Personality
Introduction to Psychological Inquiry
Introduction to Psychology

Psychological Assessment
Psychology and its applications
Quantitative Data Analysis
Systems and Schools in Psychology
Understanding the Human Psyche
Communication Skills
Computational Skills
Counselling Skills
Experiencing the Self as a Relational Entity
Psychology of Relationships
Understanding the Self and Others
Applied Cognitive Psychology
Applied Social Psychology
Introduction to Transpersonal Psychology
Positive Psychology
Psychology of Health and Yoga
Sports and Exercise Psychology

Post Code: TA-13
Discipline: Server Administration

Advanced Linux Server Administration
Advanced Windows Server Administration
Advanced Database Server Administration (General)
VMware vSphere Administration
VMware vCenter Administration
Windows Desktop Troubleshooting and Management
Virtual Machine Concepts
Operating System Virtualization Concepts
Containerization Concepts
Storage Server Management Concepts
Disk Partitioning Concepts
Linux File System Management
RAID Configurations
Network Configurations
MySQL Database Administration
Microsoft SQL Server Database Administration
Database Design and Performance Tuning
Database backups and restoration
Application Servers
Load Balancing Concepts
Web Servers: IIS, Apache, Nginx
Web Hosting
SSL Certificate Management
Cryptographic Techniques
Virtual Host Concepts
DNS Servers
DHCP Servers
Active Directory Services
Windows Group Policies
Windows update management
Proxy Servers
File Sharing Servers
Server logging and log file management
Shell Scripting

Tasks/Jobs Scheduling
Server security and Server hardening
Server Backup and Recovery Tools and Methods
Best practices around management, control, and monitoring of server infrastructure

Post Code: TA-14
Discipline: Social Work/ Sociology

Sociology
Introduction to Sociology, Fundamentals of Sociology, Elements of Sociology, Principles of Sociology, General Sociology, Sociological Concepts, Study of Society, Social structure of Indian Society, Indian Social System, Indian Social Institutions, History of Sociological Thought, Social Thinkers, Early Sociological Theory, Introduction to Classical Social Thinking, Founding Fathers of Sociology, Social Problems and Social Welfare, Social Concerns, Social Pathology, Social Disorganisation, Social Policy, Social Demography, Population Education, Rural Sociology, Social Change, Urban Sociology, Social Stratification and Mobility, Socialisation and Social Control, Social Conflicts/Social Movements, Sociology of Women and Society, Public Health And Hygiene, Sociology of Family, Sociology of Mass Communication, Sociology of Health, Study of Weaker sections, Applied Sociology, Participatory Sociology, Personnel Management, Social Statistics
Social Work
Foundations of Social Work, Social Science Concepts and Social Work, Communicative English, Social Casework, Social Group Work, Social Work Practice, Community Organization and Social Action, Contemporary Social Problems and Concerns, Programme Media and Its Application, Social Work Research, Human Rights and Social Justice, Social Legislation in India, Skill Development and Entrepreneurship, Social Policy, Planning and Development, Health: Issues and Concerns, Disaster Management, Environmental Social Work, Social Deviance, Project Formulation, Counselling and Guidance, Social Welfare Administration

Post Code: TA-15
Discipline: X-Ray

Fundamental concepts
Electricity, Electronics and magnetism
Physics of x-rays
Generation and control of x-rays
Radiation units and Interaction with medium
Radiation Detection and measurements
Screen film Radiography
Mammography
Computed and Digital Radiography
Computed Tomography Scanner
Radiological Health and Safety

Post Code: TA-16
Discipline: Veterinary Science

Veterinary Anatomy
Veterinary Physiology
Veterinary Biochemistry
Livestock Production Management
Veterinary Microbiology
Veterinary Pathology
Animal Genetics and Breeding
Animal Nutrition
Veterinary Pharmacology and Toxicology

Veterinary Public Health and Epidemiology
Veterinary Parasitology
Livestock Product Technology
Veterinary and Animal Husbandry Extension Education
Veterinary Clinical Practices
Livestock Farm Practices
Veterinary Surgery and Radiology
Veterinary Medicine
Veterinary Gynaecology and Obstetrics
Lab animal management

Post Code: LA-01
Discipline: Laboratory

Secondary Level Basic Science and Laboratory Practices

Post Code: LA-02
Discipline: Plumber

Secondary Level Basic Science and Plumbing Trade

ADMINISTRATIVE OFFICER