

SYLLABUS FOR COMPUTER BASED RECRUITMENT TEST (CBRT)
FOR THE POST OF ASSISTANT PROFESSORS IN COMPUTER ENGINEERING
UNDER
DIRECTORATE OF TECHNICAL EDUCATION
(GOA COLLEGE OF ENGINEERING)
(Advt No. 08 Year 2022)

I. General English including Grammar - 05 marks

II. General Knowledge, Current Affairs and Events of National and International Importance - 10 marks

III. Logical Reasoning and Analytical Ability - 10 marks

IV. Core: - 50 marks

1. Language processor concepts. Data Structures for language processors. Introduction to Compiler, Phases of compilation, Bootstrapping and Porting, Compiler writing tools. The role of a lexical analyser. Design of lexical analyzer. Implementation of lexical analyzer. A Language for specifying lexical analyzer. Study of the features and applications of LEX/FLEX tool.

2. Code generation: Issues in the design of a code Generator, Basic blocks and flow graphs, Next-use information, A simple Code generator, The DAG representation of Basic blocks, Peephole Optimization, Generating code from DAGS. Code optimization: The principle sources of optimization, Optimization of basic blocks, Machine dependent optimization, Register allocation optimization.

3. Types of Data: Attributes and Measurement, Types of Data Sets Data Quality: Measurement and Data Collection Issues, Issues Related to Applications Data Pre-processing : Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Discretization and Binarization, Variable Transformation.

4. Data Structure and Algorithms Design: Analysis of Algorithms – Time and Space Complexity, Complexity Notation, Solving Recurrence Relations.; Divide-and-Conquer as a Design Technique; Recursion – Design of Recursive Functions / Procedures, Tail Recursion, Conversion of Recursive Functions to Iterative Form. Linear data structures – Lists, Access Restricted Lists (Stacks and Queues) – Implementation using Arrays and Linked Lists; Searching and Order Queries. Sorting – Sorting Algorithms (Online vs. Offline, In-memory vs. External, In-space vs. Out-of-space, Quick Sort and Randomization). Unordered Collections: Hash tables (Separate Chaining vs. Open Addressing, Probing, and Rehashing). Binary Trees – Tree Traversals. Partially Ordered Collections: Search Trees and Height Balanced Search Trees, Heaps and Priority Queues. Algorithm Design: Greedy Algorithms and Dynamic Programming. Graphs and Graph Algorithms: Representation schemes, Problems on Directed Graphs (Reachability and Strong Connectivity, Traversals, Transitive Closure. Directed Acyclic Graphs - Topological Sorting), Problems on Weighted Graphs (Shortest Paths. Spanning Trees). Introduction to Complexity Classes (P and NP) and NP-completeness. NP-Hard problems. Designing Algorithms for Hard Problems – Backtracking, Branch-and-Bound, and Approximation Algorithms.

5. Operating Systems: Introduction, Process, Thread, Synchronization, Deadlock, Memory Management, File Systems and Mass storage. Multi-processor / Multi-core

Operating Systems: Introduction, Basic architecture, Interconnection networks, Caching, Threads, Synchronization, Scheduling, Memory Management and Reliability / Fault tolerance. Distributed Operating Systems: Introduction, Issues and Limitations of DOS, Communication networks, Communication primitives, Logical and vector clocks, Causal ordering of messages, Global state, Termination detection, Mutual exclusion algorithms – Non-token based algorithms: Lamport's, RicartAgrawala, Maekawa's; Token based algorithms: Suzuki-Kasami's, Singhal's, Raymond's. Deadlock detection: Centralized, distributed and hierarchical deadlock detection algorithms; Agreement Protocols: Classification – Byzantine, Consensus, Interactive Consistency; Solutions and Applications of agreement algorithms. Distributed Resource Management: Distributed File Systems, Distributed Shared Memory, Distributed Scheduling.

6. Database Systems: ER and EER Model, Relational schema, Relational database design, normalization, Relational algebra, SQL queries and integrity constraints, transaction management, concurrency control, crash recovery, storage and indexing.

7. DataMining: The concepts and techniques of data mining, decision support tool, data analysis tools such as Online Analytical Processing (OLAP), Data mining tasks like constructing decision trees, finding association rules, classification, and clustering. A broad understanding in the design and use of data mining algorithms that will have database, statistical, algorithmic and application perspectives of data mining.

8. Basic Image Processing Tools: Pixel Brightness (Grey level) Transformation – Image Enhancement Based on Histogram, Contrast Stretching; Concepts and Models of Image Processing; Image Smoothing using Spatial Domain Methods – 10 Neighbourhood Averaging, Threshold Averaging, Gaussian Filtering, Median Filtering, Weighted Median Filtering; Image Smoothing using Frequency Domain Methods – Ideal Low Pass Filtering, Trapezoidal Low Pass Filtering, Butterworth Low Pass Filtering; Image Enhancement – Gradient Image, Gradient Operators, High Pass Filtering; Image Restoration – Image Degradation Model, Image Restoration Based on the Degradation Model, Inverse Filtering, Wiener Filtering, Geometric Rectification; Processing Methods using Partial Differential Equations – Diffusion Based Models, TV Based Models, Discrete Formats of PDE Models

9. Basics of Neural Networks. Structure and function of a single neuron. Neural Net Architecture. Neural Learning. Common usage of neural networks in classification, clustering, vector quantization. pattern association, function approximation and forecasting. Evaluation of networks. Implementation of neural networks. Perceptrons. Linear Separability Perceptron Training Algorithm, Guarantee of Success, Pocket algorithm, Adaline. Multilayer networks, Multilevel discrimination, Architecture, objectives and working of Backpropagation algorithm. Setting the parameter values of Backpropagation algorithm. Accelerating learning process and applications of Backpropagation algorithm.

10. Cloud Computing Fundamental: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications. Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment.

11. Project Organization: Scheduling, Monitoring and Control Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts. Dimensions of Project Monitoring & Control. Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error

Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

12. Networking Systems : Layers, Protocols and Services, Networks, LAN, MAN, WAN Multimedia Communication Systems : Application Subsystem, Transport Subsystem, Quality of Service and Resource Management Database Systems: Multimedia Database Management Systems , Characteristics of an MDBMS, Data Analysis, Data Structure, Operations on Data, Integration in a Database Model UNIT - 4 (10 Hours) User Interfaces: General

13. Web Service and SOA fundamentals: Introduction, Concept of Software as a Service(SaaS), Web services versus Web based applications, Characteristics of Web services, Service interface and implementation, The Service Oriented Architecture(SOA), Quality of service (QoS), Web service interoperability, Web services versus components, RESTful services , Impact and shortcomings of Web services. Web Services Architecture: Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services, developing web services enabled applications

Note:

Duration for C.B.R.T : 90 Minutes

Maximum Marks for C.B.R.T : 75 Marks