

পদের নাম: Lecturer (Information and Communication Technology)

বিষয় : কম্পিউটার বিজ্ঞান (Computer Science)

কোড : ৪৩১

পূর্ণমান-১০০

Exam Duration: Three Hours

Instructions

Candidates will have to answer 10 questions prepared from 10 units each carrying 10 Marks. Each question will have 2 to 3 sub-items (e.g. a, b, c). The distribution of marks for each question can be 2+3+5, 3+3+4, 3+7, 2+2+6, 5+5 or 4+6. Questions will be prepared following Bloom's taxonomy of cognitive learning. A minimum of 20% marks should be allotted to higher order questions which require analyzing, evaluating, complex problem solving or creating/synthesizing. There will be alternatives for three questions; an alternative question must be prepared from the same unit with same structure covering same sub-domain and mark distribution.

Assessment targets The candidate will be able to -	Contents	Marks
<ul style="list-style-type: none">describe evolution of computer.explain different functions of basic components of computer systemdemonstrate basic understanding of recent information and communication technologies and their applications	Unit 1: Introduction to Computer and Recent ICT Developments <ul style="list-style-type: none">History, types, and generations of computer;Basic organization of computer;Peripherals of computers and it's operations;Introduction to Robotics, Artificial Intelligence, Internet of Things (IoT), Augmented Reality, Virtual Reality, Biometrics, Nanotechnology and Cloud Computing.	10
<ul style="list-style-type: none">demonstrate a clear understanding of various data structures and their functions.identify appropriate algorithm for solving a given problem with justifications in terms of time and memory complexity.	Unit 2: Data Structure and Algorithm <ul style="list-style-type: none">Basics of data structure, big o notation, complexity of algorithm and time space tradeoff, pseudo code;Array, heap, stack, queue, linked list (singly and double) recursion, trees;Sorting algorithms (insertion sort, selection sort, bubble sort, quick sort, merge sort, radix sort, heap sort, etc.);Factorial and tower of hanoi problem;Searching techniques (linear and binary search);Tree traversal algorithm, greedy algorithms, graph searching, BFS, DFS;Divide and conquer algorithms: the greedy method; dynamic programming, basic traversal & search techniques, backtracking, branch and bound.	10
<ul style="list-style-type: none">explain basic concepts and terms regarding structured programming and object-oriented programming	Unit 3: Programming Language <ul style="list-style-type: none">Structure Programming: overview of C, C++ and java, constants, variables and data types, operator & expression, managing input & output operators,	10

Assessment targets The candidate will be able to -	Contents	Marks
<p>language.</p> <ul style="list-style-type: none"> • solve various real-life problems using structured programming and object-oriented programming language. 	<p>decision making and branching, decision making and looping, arrays, handling of character string, user-defined function, structure and union, pointers, file management;</p> <ul style="list-style-type: none"> ▪ Object Oriented Programming: principles of object-oriented programming, tokens, expressions and control structure, functions, arrays, strings, pointers, references, basic input/output, classes and objects, constructors and destructors, operator overloading, inheritance, polymorphism and encapsulation, interfaces, files and streams, exception handling, dynamic memory. 	
<ul style="list-style-type: none"> • explain various concept of discrete mathematics and numerical analysis • analyze and evaluate different problems of discrete mathematics and numerical analysis • analyze and evaluate different applications of discrete mathematics and numerical analysis 	<p>Unit 4: Discrete Mathematics and Numerical Analysis</p> <ul style="list-style-type: none"> ▪ Discrete Mathematics: set theory, relations, functions, graph theory, algebraic systems, group theory, homomorphism, mathematical reasoning, theories with induction. Recurrence function; ▪ Numerical Analysis: numerical solution of polynomials; ▪ Numerical Solution of Simultaneous Linear Equation: numerical solution of ordinary differential equation, direct methods for systems of linear equations, iterative techniques and advantages in solving systems of linear equations. 	<p>10</p>
<ul style="list-style-type: none"> • analyze and evaluate a system having clear understanding of software engineering • explain compiler working principles. • construct compiler. 	<p>Unit 5: Software Engineering and Computer Design</p> <ul style="list-style-type: none"> ▪ Software Engineering: paradigms, requirements analysis fundamentals, software design fundamentals, software testing techniques and strategies, software management and maintenance technique, case; ▪ Computer Design: introduction to compiler, a simple one pass compiler, lexical analysis, basic parsing technique, syntax directed translation, runtime environment, intermediate code generation, code generation, code optimization. 	<p>10</p>
<ul style="list-style-type: none"> • explain various number systems, theorems, logic gates and memory management • perform conversion of different number systems • simplify boolean algebra • evaluate various logic gates • explain/differentiate computer architecture and 	<p>Unit 6: Digital Logic Design and Computer Architecture</p> <ul style="list-style-type: none"> ▪ Number systems and codes; ▪ Boolean algebra, de morgan's theorems; ▪ Logic gates and their truth tables, karnaugh map method ▪ Combinational logic circuits, decoder, encoder, multiplexed, and de-multiplexer, flip flop; ▪ asynchronous and synchronous counters; ▪ D/A converter circuitry, A/D converter circuitry; ▪ Instruction sets, addressing modes and types of 	<p>10</p>

Assessment targets The candidate will be able to -	Contents	Marks
<p>it's application.</p> <ul style="list-style-type: none"> • . design a particular circuit for practical applications 	<p>instruction;</p> <ul style="list-style-type: none"> ▪ Memory organization, caching; ▪ Central processing unit, control units; ▪ Fundamentals of parallel and distributed processing; ▪ Pipelining and data flow; ▪ Array processing and vector processing. 	
<ul style="list-style-type: none"> • explain concept and terms related to operating system and embedded programming • explain working principle of operating system and it's different elements • analyze and evaluate different operating system structure, working principles and it's usability in different cases • understand and explain embeded system 	<p>Unit 7: Operating System and Embedded Programming</p> <ul style="list-style-type: none"> ▪ Operating System: definition and types OS, OS structures, processes, CPU scheduling, process synchronization, deadlocks, memory management, virtual memory, file concept, file system implementation ▪ Concept and applications of visual programming, system programming, general machine structures, internet programming, environments, multiple document interfaces, activex controls and activex components, API, web (Apache/IIS) server, OLE automation, web-based application development and state management, kernel programming, programming for memory management, interrupt handling, linux module programming; 	<p>10</p>
<ul style="list-style-type: none"> • explain different concept and terms of dbms, e-commerce and web application engineering • explain working principle of different database management systems • analyze and evaluate different cases for building a real-life application 	<p>Unit 8: DBMS, E-Commerce and Web Application Engineering</p> <ul style="list-style-type: none"> ▪ Database Management System (DBMS): data, database, database management, data abstraction, database model, database relation, database security, etc; ▪ Database Languages: data management; types of database, database system structure, relational algebra and SQL. Database design, indexing, normalization; ▪ Concept of e-government and its scope, unicode and ict in local languages, issues in transliteration and natural language translation, it workforce, concepts in bridging the digital divide, models of public-private partnerships (PPP), application scenarios for G2G, G2B and G2C categories of e-business (B2B, B2C, B2A, etc), electronic markets; ▪ Introduction to web and web application; ▪ Web Essential: client, server and protocols, http request and response message, web application, CGI, web server mode, logging, access control, HTML/XHTML, CSS, Javascript, W3C standard, pattern, service locator pattern, data access object pattern, persistent communication, web application security: policy, network-level security: SSL, etc 	<p>10</p>

Assessment targets The candidate will be able to -	Contents	Marks
<ul style="list-style-type: none"> • explain different concept and terms • explain working principle of different computer network and distributed system • analyze and evaluate different cases for building a real-life application 	<p>Unit 9: Computer Network and Distributed System</p> <ul style="list-style-type: none"> ▪ Basic computer network concept, network structure, network software, reference model, OSI model, TCP/IP model, x.25 networks, frame relay, atm network, medium access sub-layer, network layer, application layer, communication mediums, network topologies, communication devices, synchronous and asynchronous communication, transmission band; ▪ Introduction To Parallel and Distributed Systems: architecture, challenges, principle and paradigm; ▪ Security: threats and attacks, different malware and it's protection, policy and mechanism, design issue, cryptography and cryptographic algorithms, cryptographic protocols, key distribution, basic concept of naming services, dns, attribute based naming; ▪ Distributed File Systems: client perspective, server perspective, NFS, coda, google file system(GFS). Parallel programming: parallel computing, parallel programming structure 	<p style="text-align: center;">10</p>
<ul style="list-style-type: none"> • explain different concept and terms related to artificial intelligence • explain and analyze different algorithms in developing artificial intelligence • analyze and evaluate different cases for building a real-life application 	<p>Unit 10: Artificial Intelligence</p> <ul style="list-style-type: none"> ▪ Overview of AI; ▪ AI Programming Language: prolog, environment types, agent types, agent model, reactive agents; ▪ Perception: neurons-biological and artificial, perceptron learning, general search, local searches: hill climbing, simulated annealing, constraint satisfaction problems. Genetic algorithm; ▪ Game Theory: motivation, minimax search, resource limits and heuristic evaluation, α-β pruning, stochastic games, partially observable games; ▪ Neural Networks: multi-layer neural networks; ▪ Machine Learning: supervised learning, decision trees, reinforcement learning, general concepts of knowledge, knowledge representation. 	<p style="text-align: center;">10</p>