

B.Sc. (Hons.) SEMESTER V EXAMINATION 2016-17**COMPUTER SCIENCE****BCS - 501 : Net Centric Computing****Time : Three hours****Max. Marks : 70***(WRITE YOUR ROLL NO. AT THE TOP IMMEDIATELY ON THE RECEIPT OF THIS QUESTION PAPER)***NOTE : ANSWER ANY FIVE QUESTIONS INCLUDING QUESTION NO. 01, WHICH IS COMPULSORY.**

1. a) Mention the difference between two types of transmission technology : broadcast link and point to point links. 3
b) What are the basic services provided by third (3G) generation mobile phones? 3
c) Mention the advantage of DHCP protocol over BOOTP protocol. 3
d) What are the four primary qualities of service parameters? 2
e) What is domain name space? 3
2. a) Explain the functionalities of various layers, in brief of TCP/IP reference model. 2
b) Explain three main multiplexing techniques : FDM, TDM & WDM. Also, distinguish between synchronous and statistical TDM. 2
3. a) Five bit messages are transmitted using a Hamming code. How many check bits are needed to ensure that the receiver can detect and correct single bit errors? Show the bit pattern transmitted for the message 11010. Assume that even parity is used in the Hamming code. 4
b) Explain the reason for moving from stop and wait ARQ protocol to the CO-BACK-N-ARQ protocol. 3
c) What is Point-to-point protocol (PPP)? 1
4. a) Datagram subnets route each packet as a separate unit independent of all others. Virtual Circuit subnets do not have to do this, since each data packet follows a predetermined route. Does this observation mean that virtual circuit subnets do not need the capability to route isolated packets from an arbitrary source to an arbitrary destination? Explain your answer. 4
b) Draw the IPv4 datagram header format and explain the fields in brief. 5
c) Explain any static routing algorithm. 5
5. a) What are the Byte numbers and sequence number in TCP protocol? Explain three way handshaking method of connection establishment of a TCP connection. 7
b) What is the difference between open-loop congestion control and closed loop congestion control? Explain any **two** methods of congestion control in datagram subnet. 7

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|----|----|---|---|
| 6. | a) | Explain the role of Message Transfer Agent (MTA) in Email architecture. | 5 |
| | b) | What are cookies? | 4 |
| | c) | What is the main objective of 'Simple Network Management Protocol' (SNMP)?
Explain, how it works? | 5 |
| 7. | a) | What is the difference between symmetric and asymmetric key Cryptography?
Explain RSA algorithm for asymmetric key Cryptography. | 7 |
| | b) | What is digital signature? How does it help in network security? | 7 |

B.Sc.(Hons) Semester V Examination, 2016-17

Paper: BCS-502 (Operating System Concepts)

Time: Three Hours

Note: Answer five questions in all, including Question No.1, which is compulsory. Figures on the right-hand side of the margin indicate maximum marks for each question.

1. Answer any six of the followings:

- (a) Define the term Operating System and distinguish between internal and external views of an operating system.
- (b) What are the main design goals of an operating system? Explain them in brief.
- (c) What is starvation problem? Mention which scheduling algorithms suffer from this problem.
- (d) Distinguish between a process and a thread. State the major advantages of having threads.
- (e) What is System Resource-Allocation Graph? Describe.
- (f) When Dynamic Loading and Dynamic Linking are required?
- (g) Briefly discuss about any three free-space management schemes for disk.

2. (a) Briefly explain the different process states and transition among the states with transition diagram.
- (b) Explain the three-level scheduling, which may coexist in a complex operating system.
- (c) Consider the following five processes, with the length of the CPU burst given in milliseconds:

Process	Burst Time
P ₁	10
P ₂	29
P ₃	3
P ₄	7
P ₅	12

Illustrate the First Come First Serve (FCFS), Non-Preemptive Shortest Job First (S.J.F) and Round Robin (RR) (Time Quantum=10 milliseconds) scheduling algorithms using Gantt Chart. Which algorithm will give the minimum average time?

3. (a) What do you mean by memory fragmentation? Differentiate between internal and external memory fragmentation.
- (b) Define the notion of Logical and Physical Addresses. How is logical address translated to physical address in Paging? Explain with a neat diagram.
4. (a) What is Demand Paging? Explain the steps involved in Page fault handling.
- (b) What is Belady's anomaly? Illustrate this anomalous behavior in FCFS with a suitable example.
- (c) Explain the Working Set Model. Explain how it is used for enhancing effective memory bandwidth in practice.

- 5 (a) Describe the physical and logical views of a disk storage system. (4)
- (b) Suppose that a disk drive has 5,000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order is (9)

86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms

- (i) FCFS
- (ii) SSTF
- (iii) SCAN

- 6 (a) Describe the deadlock detection algorithm for a system with multiple instances of Resource Types. (6)
- (b) Consider the following snapshot of a system: (1+4+2)

	<u>Allocation</u>				<u>Max</u>				<u>Available</u>			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following questions using the banker's algorithm:

- a. What is the content of the matrix *Need*?
- b. Is the system in a safe state?
- c. If a request from process P1 arrives for (0, 4, 2, 0), can the request be granted immediately?

- 7 Write notes on the followings: (3+4+3+3)
- (a) Dining Philosopher Problem.
 - (b) Critical Section and Semaphores.
 - (c) Indexed File Allocation Method.
 - (d) Directory Structure.

Roll No.

B.Sc. (Hons.) SEMESTER V EXAMINATION 2016-17**Computer Science****BCS - 503: Discrete Mathematical Structures**

Time: Three Hours

Full Marks: 70

(Write your Roll No. at the top immediately on the receipt of this question paper)

Note: Answer any five questions. Terms/Symbols used have their standard meanings

- Q.1 Define the following terminologies and explain with appropriate examples. 2
- (a) Poset (b) Regular Graph (c) Clique (d) Fundamental Circuit
(e) Bipartite Graph (f) Minimal Covering (g) De Morgan's Law
- Q.2 (a) Explain partition of a set and equivalence classes with suitable example: 3
- (b) What is Hasse Diagram? Draw the Hasse Diagram for the relation R on set $A = \{a, b, c, d, e\}$ where R is given as: $R = \{ \langle a, a \rangle, \langle a, c \rangle, \langle a, d \rangle, \langle a, e \rangle, \langle b, b \rangle, \langle b, c \rangle, \langle b, d \rangle, \langle b, e \rangle, \langle c, c \rangle, \langle c, d \rangle, \langle c, e \rangle, \langle d, d \rangle, \langle e, e \rangle \}$. 4
- (c) Find the inverse of the function $f(x) = 4e^{(6+2)}$ 3
- (d) A mobile manufacturing company assembled 30 mobiles. The features available are Bluetooth, Wi-Fi and 4G network. It is known that 15 of the mobiles have Bluetooth, 8 of them have Wi-Fi, 6 of them have 4G network, and 3 of them have all three features. Find that at least how many mobiles do not have any features at all. 4
- Q.3 (a) For an algebraic system (A, \vee, \wedge) defined by a lattice (a, \leq) , show that 5
- (i) $a \leq a \vee b$, $a \wedge b \leq a$ and (ii) $a \vee (a \wedge b) = a$, $a \wedge (a \vee b) = a$ where $a, b \in A$
- (b) Define Boolean lattice and Boolean algebra. Prove that an element in a Boolean lattice has unique complement. 5
- (c) Given a function $f: \{0, 1\}^3 \rightarrow \{0, 1\}$ defined as: $f(0, 0, 0) = 1$, $f(0, 0, 1) = 0$, $f(0, 1, 0) = 1$, $f(0, 1, 1) = 0$, $f(1, 0, 0) = 0$, $f(1, 0, 1) = 0$, $f(1, 1, 0) = 0$, $f(1, 1, 1) = 1$. Express the function in disjunctive normal form and conjunctive normal form of Boolean expression. 4
- Q.4 (a) Determine whether each of the following compound propositions is a tautology or not. 3
- (i) $(\neg p \wedge \neg q) \rightarrow (p \rightarrow q)$, (ii) $(p \rightarrow q) \rightarrow (p \wedge \neg q)$, (iii) $p \wedge (p \rightarrow \neg q) \rightarrow q$
- (b) Show that $\neg(p \vee (\neg p \wedge q)) \equiv \neg p \wedge \neg q$ and $\neg \forall x (P(x) \rightarrow Q(x)) \equiv \exists x (P(x) \wedge \neg Q(x))$ without truth table. 4
- (c) Solve the following recurrence relations 7
- (i) $4a_r - 20a_{r-1} + 17a_{r-2} - 4a_{r-3} = 0$, and (ii) $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2 - 2r + 1$
- Q.5 (a) Prove that the number of vertices of odd degree in graph is always even. 2
- (b) Draw the graphs of the following types. 3
- (i) Graph is both Hamiltonian and Euler
- (ii) Graph is Euler but not Hamiltonian
- (iii) Graph is Hamiltonian but not Euler
- (c) What is meant by centre of a graph? Prove that a tree may have one or two centres. 2

- (d) What will be the minimum and maximum possible height of a binary tree with n vertices? 2
- (e) What are the Kuratowski's two graphs? Also draw these two graphs. 2
- Q.6 (a) How to prove that a graph is non-planar show as example. 4
- (b) What is geometric dual of a graph? If r and μ denote the rank and nullity of a graph G , and if r^* and μ^* denote the same for dual graph G^* then prove that $r^* = \mu$ and $\mu^* = r$. 4
- (c) Let $G = (V, E)$ be a connected weighted and undirected graph, where $V = \{a, b, c, d, e, f, g\}$ is the set of vertices and $E = \{((a, b), 3), ((a, c), 2), ((b, d), 1), ((c, d), 5), ((c, f), 7), ((d, e), 3), ((d, f), 6), ((e, g), 8), ((f, g), 4)\}$ is the set of edges along with weight of corresponding edge. Find the minimal spanning tree of G using Kruskal's and Prim's algorithms with demonstration of steps in both the methods. 6
- Q.7 (a) What is chromatic partitioning? Explain with example. 3
- (b) What is chromatic polynomial? Find the chromatic polynomial of a complete graph of n vertices and a tree of n vertices. 5
- (c) Explain the reduced incidence matrix A_f , fundamental circuit matrix B_f , and fundamental cutset matrix C_f of a connected graph. Use a common graph and common spanning tree to explain these matrices. What is the relationship among them? 6

B.Sc. (Hons.) SEMESTER V EXAMINATION 2016-17**COMPUTER SCIENCE****BCS - 504A : System Analysis and Design****Time : Three hours****Max. Marks : 70****(WRITE YOUR ROLL NO. AT THE TOP IMMEDIATELY ON THE RECEIPT OF THIS QUESTION PAPER)****NOTE : ANSWER ANY FIVE QUESTIONS AND THE FIGURES IN THE RIGHT HAND MARGIN INDICATE MARKS.**

1. a) Write the IEEE definitions of the following term in connection with software : 6
 i) Error ii) Fault
 iii) Failure
- b) Design an ER diagram for Library Management System. Specify all constraints that should hold on the database. Make sure that it has atleast three entity types, two relationship types, a weak entity type, a super class/subclass relationship and n-ary ($n > 2$) relationship type. 8
2. a) Describe software crisis and the goals of software engineering. 7
 b) Write four important attributes of software products and differentiate them with hardware products. 7
3. a) Compare prototyping and iterative software development process models by listing their strengths and weakness. 7
 b) Describe at least five important characteristics of an SRS. 7
4. a) What is the role of problem analysis in software development? Explain the use of Data Flow Diagrams in problem analysis by an example. 7
 b) What are use cases? Where are these use cases used during software development process? Explain through an example. 7
5. a) What do you understand by a module? What are the modularization criteria used for function-oriented design to produce modular designs? 7
 b) Explain all four major steps of structured design methodology using one example. 7
6. a) Write the purpose of the following diagrams of UML used in object-oriented design : 7
 i) Class diagram ii) Interaction diagram
 iii) Activity diagram
- b) What do you understand by test cases and test criteria? Write the differences between black-box and white-box testing. 7
7. Write short notes on the following : 7
 i) Test oracle 1
 ii) Software maintenance 1
 iii) Data dictionary 1
 iv) Open-closed principle 1
