

# COMPUTER SCIENCE (OPTIONAL) PAPER-I

**TIME ALLOWED: THREE HOURS**

**MAXIMUM MARKS: 100**

**NOTE:** Attempt any FIVE questions. Be brief and keep your answer within the limits mentioned in questions

- Q.1 What is micro-kernel? Briefly describe the main parts of an operating system (4-5 lines each). 20
- Q.2 List five different programming paradigms along with their differentiating feature(s) and application areas. Also give name of two languages for each paradigm. (4-5 lines each). 20
- Q.3 Describe Relational, Temporal, Logic-Based and Spatial Databases along with their area of application (4-5 lines each). What is the purpose of Dataware House and what is its link with Data Mining (5-7 lines)? 20
- Q.4 Define Mealy and Moore machines. Design a synchronous counting machine, with minimum number of gates and flip-flops which can generate the sequence 1, 3, 5, 7, 2, 4 in the given order in binary form.
- Q.5 The greatest common divisor of integers a and b is the largest integer that evenly divides both a and b. Write recursive function gcd that returns the greatest common divisor of a and b. The gcd of a and b is defined recursively as follows: if b is equal to 0, then gcd (a, b) is a; otherwise gcd (a, b) is gcd (b, a%b), where % is the modulus operator. Use any programming language of your choice and also draw the flow chart. 20
- Q.6 In a bank management system, there are customers which can open account with single or multiple ownership, customer can avail the facility of leasing if the salary is greater than 30,000/month. Customer can also request for credit card facility. One account is associated with exactly one branch of bank as bank is having multiple branches. One branch is having exactly one manager and vice versa. Draw Entity Relationship Diagram (ERD) using any notation of the scenario discussed above. 20
- Q.7 Answer each of the following questions briefly (4-5 lines each):
- (a) Suppose one is interested in supporting real-time communication in a local area network, i.e., one is interested in bounding the amount of time it takes to send a packet from one host to another on the network. Would you recommend CSMA or token passing for such a network? Why? 5
- (b) What is the purpose of the connection-oriented welcoming socket, which the server uses to perform an accept ()? Once the accept () is done, does the server use the welcoming socket to communicate back to the client? Explain. 5
- (c) Suppose a web server has 1000 ongoing TCP connections. How many server-side sockets are used? How many server-side port numbers are used? Briefly (two sentences at most each) explain your answer. 5
- (d) What is meant by network-assisted congestion control? Given an example of a congestion control protocol that takes this approach. Does TCP take this approach? Explain your answer. 5