(3 Hours) **[Total Marks: 80]**

N.B.: (1) Question **No.1** is **Compulsory**.
(2) Attempt **any three** questions from **remaining** questions.
(3) Assume **suitable** data wherever required but **justify** the same.
(4) **Figures** to the **right** indicate **full marks**.
(5) Answer to each new question to be started on a **fresh page**.

1. (a) Define Simulation. With the help of neat flowchart, explain the steps in simulation study. **(10)**

(b) A sequence of 1000 three-digit numbers has been generated and an analyst indicates that 290 have three different digits, 570 contain exactly one pair of like digits, and 140 contain exactly three like digits. Based on Poker test, check whether these numbers are independent. Use $\alpha = 0.05$ *and* $\chi^2_{0.05,2} = 5.99$. **(10)**

2. (a) The inter-arrival time and the service times of the 10 jobs arriving in the computer system are given as follows: **(10)**

Inter-arrival time (min)	--	0	60	60	120	0	60	120	0	120
Service time (min)	25	50	37	45	50	62	43	48	52	38

Compute the following:
i. Average time job spends in the queue.
ii. Average processing time of the jobs.
iii. Maximum time job spends in the system.

(b) If the inter-arrival time ranges from 2 to 6 minutes with equal probability and the random digits generated are 51, 27, 63, 89, 11, and 45 with a uniform service time of 3 minutes, generate the FEL with primary events. Also calculate the total busy time of the server and the minimum queue length. **(10)**

3. (a) Explain Poisson process and state its properties. Gaurav is quite a popular student. He receives, on the average, four phone calls a night with Poisson distribution. What is the probability that tomorrow night the number of calls received will exceed that average by more than one standard deviation? **(10)**

(b) Design a generator for the discrete distribution whose pmf is given below: **(10)**

$$p(x) = \frac{2x}{k(k+1)}, x = 1,2, \dots, k$$

Generate the random variate for $R_1 = 0.3456$ and $R_2 = 0.8912$

4. (a) Consider the following data for the M/M/1 queue simulation. $R_0 = 10$, d = 2, and S_0^2=25.30. Estimate the long-run mean queue length, L_Q, within ε = 2 customers with 90% confidence. From the table, the value of $Z_{0.05} = 1.645$. How many additional replications are required? **(10)**

(b) What do you understand by calibration and validation of models? How can one increase the face validity of a model and validate the model assumptions? **(10)**

5. (a) Give the equations for steady state parameters of M/G/1 queue and derive M/M/1 from M/G/1. **(10)**

(b) What are the costs associated with inventory system? Describe the inventory system when - **(10)**

i. Lead time is zero.
ii. Lead time is independent of demand.
iii. Lead time is dependent on demand.

6. Write short notes on (**any two**): **(20)**

(a) Goals and Issues in simulation of manufacturing systems.
(b) Multivariate and Time-series Input Models.
(c) Areas of Applications of Simulation.
(d) Output analysis for terminating simulation.

(Time: 3 Hours) **Total Marks:80**

Note: 1) Question no. 1 is compulsory.

2) Solve any three out of remaining five questions.

3) Assume suitable data wherever necessary.

Q.1 . a) Define software testing. Explain software testing model with a neat diagram. (05)

b) Classify bugs based on SDLC. (05)

c) Is white-box testing really necessary? Give reasons. (05)

d) "Regression testing produces quality software". Justify with reasons. (05)

Q.2. a) What are the features of V-testing model? Explain in detail. (10)

b)Which type of testing is possible with equivalence class partitioning? (10)

A program takes an angle as input within the range [0,360] and determines in which quadrant the angle lies. Design test cases using equivalence class partitioning method.

Q.3. a) Consider the following program for calculating the factorial of a number. It consists of main( ) program and the module fact( ). Calculate the individual cyclomatic complexity number for main( ) and fact( ) and then the cyclomatic complexity for the whole program. Draw DD graph. List all independent paths and design test cases from independent paths.

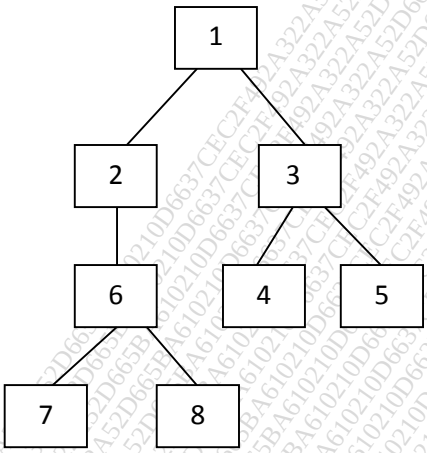
```
main()
 {
  int number;
  int fact();
  clrscr();
  printf("enter the number whose factorial is to be found out");
  scanf("%d", & number);
  if (number < 0)
     printf("factorial cannot be defined for this number");
  else
     printf("factorial is %d", fact(number));
 }


int fact( int number )
{
  int index;
  int product=1;
  for ( index=1; index<=number; index++)
```

```
        product=product*index;
    return(product);
}
```

b) Describe types of static testing in detail. (10)

Q.4. a) Why do we need integration testing? (10)

Perform top-down and bottom-up integration procedure from the following system hierarchy.



b) What is the need for software measurement? Discuss various types of software metrics. (10)

Q.5.a) What are the components of a test plan. Illustrate test plan hierarchy with a neat diagram. (10)

b) Describe the procedure for Test Point Analysis (TPA) with a neat diagram. (10)

Q.6. Write a short on any two. (20)

a) Software Quality Measurement.
b) Object Oriented Software testing.
c) Web based system testing.

(Time: 3 Hrs) **Marks: 80**

N.B. : 1. Question no. 1 is **compulsory**.
2. Solve any **Three** questions out of remaining **Five** questions.

Qu-1 Attempt any **FOUR** of the following.

a) How do genetic Algorithms differ from conventional optimization algorithms? **5**

b) **Demonstrate/Outline** the excluded middle axioms, extended for fuzzy sets. **5**

c) Demonstrate/outline the working of Roulette-wheel selection. **5**

d) Consider a fuzzy set and use Zadeh's notation to represent the same defined on universe X = {a, b, c, d, e, f}. Then compute/Infer λ cut for**:** a) $\lambda = 0.9$ b) $\lambda = 0.3$ **5**

e) A single-layer neural network has the weights w = [0.2 0.5 0.66 0.45] with bias b=0.3. It is given an input of I = [0.5 0.8 0.1 0.36]. **5**
Find/estimate the output if the sigmoidal activation function is used (slope = 0.3)

Qu-2 a) Determine the weights after one iteration for Hebbian learning of a single neuron network starting with initial weights w = [1 -1]. The inputs are X_1 = [1 -2], X2 = [2 3], X_3 = [1, -1] and learning rate c=1. **10**
a) Use Bipolar Binary activation function.
b) Use Bipolar continuous activation function.

b) What are Neuro-Fuzzy Systems? Explain the steps in Neuro-Fuzzy Hybrid System. **10**

Qu-3 a) Using Mamdani fuzzy model design a fuzzy logic controller to determine the wash time of a domestic washing machine. Assume that the inputs are dirt and grease on cloths. Use three descriptors for each input variables and five descriptors for the output variable. Derive a set of rules for control action and defuzzification. The design should be supported by figures wherever possible. Show/Defend that if the clothes are soiled to a larger degree the wash time will be more and vice-versa. **10**

b) Explain McCulloch Pitts neuron model with example. **10**

Qu-4 a) Describe Genetic Algorithms considering: Encoding, Selection, Crossover, Mutation, and Stopping Condition for Genetic Algorithms. **10**

b) Consider a suitable set of the binary input/output row matrix to train a hetero-associative network. Demonstrate the working of hetero-associative network and compute the final weight matrix. **10**

Qu-5 a) Explain the Backpropagation Algorithm with flowchart. **10**

b) List the variety of Genetic algorithms and explain the Hybrid GA. **10**

Qu-6 a) What is Linear Separability? Explain with example why single layer perceptron is not capable of solving Linearly Inseparable problems. **10**

b) Let R and S be two fuzzy relations defined as: **10**

$$R = \begin{array}{c} \\ x1 \\ x2 \end{array} \begin{array}{c} \begin{array}{ccc} y1 & y2 & y3 \end{array} \\ \begin{pmatrix} 0.0 & 0.2 & 0.8 \\ 0.3 & 0.6 & 1.0 \end{pmatrix} \end{array} \qquad S = \begin{array}{c} \\ y1 \\ y2 \\ y3 \end{array} \begin{array}{c} \begin{array}{ccc} z1 & z2 & z3 \end{array} \\ \begin{pmatrix} 0.3 & 0.7 & 1.0 \\ 0.5 & 1.0 & 0.6 \\ 1.0 & 0.2 & 0.0 \end{pmatrix} \end{array}$$

a) Compute/Infer the result of R°S using max-min composition**.**
b) Compute/Infer the result of R⋅S using max-product composition.

(Time: 3 Hrs) **Marks: 80**

N.B. : 1. Question no. 1 is **compulsory**.

2. Solve any **Three** questions out of remaining **Five** questions.

Q.1. (a) Explain Blooms filter for stream data mining. **(5)**

(b) Find the jaccard distance and cosine distance between the following pairs of set: X=(0,1,2,4,5,3) and Y=(5,6,7,9,10,8). **(5)**

(c) Explain the steps of the HITS algorithm. **(5)**

(d) Explain "Shuffle & Sort" phase and "Reducer Phase" in Map Reduce. **(5)**

Q.2. (a) Write a Map reduce pseudo code to multiply two matrices. Illustrate with an example showing all the steps. **(10)**

(b) Explain Hadoop Ecosystem with core components. Explain its physical architecture. State the limitations of Hadoop. **(10)**

Q.3. (a) Suppose a data stream consists of the integers 1,3,2,1,2,3,4,3,1,2,3,1. Let the Hash function being used is h(x) = (6x+1) mod 5; estimate the number of distinct in this stream using Flajolet - Martin algorithm. **(10)**

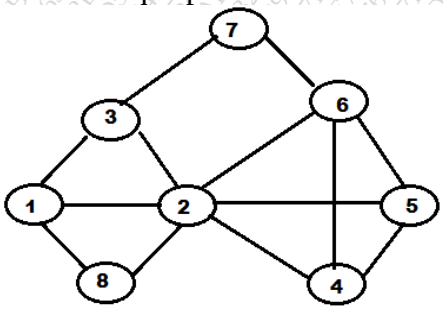
(b) Distinguish the following: **(10)**

a) PCY, Multistage

b) Document data store and Column family data store

Q.4. (a) Give two applications for counting the number of 1's in a long stream of binary values. Using a stream of binary digits, Illustrate how DGIM will find the number of 1's. **(10)**

(b) For the given graph show how clique percolation method will find cliques. **(10)**



Q.5. (a) Consider the web graph given below with six pages (A, B, C, D, E, F) with directed links as follows. **(10)**

A→ B,C

B→A,D,E,F

C→AF

Assume that the PageRank values for any page m at iteration 0 is PR(m)=1 and teleportation factor for iterations is β=0.85. Perform the page rank algorithm and determine the rank for every page at iteration 2.

(b) Explain clearly how the SON partition based algorithm helps to perform frequent item set mining for large data sets. How does this algorithm avoid false negatives? **(10)**

Q.6. (a) Explain collaborative filtering system. How is it different from content based system? **(10)**

(b) Clearly explain how CURE algorithm can be used to cluster big data sets. **(10)**

Paper / Subject Code: 53107 / Storage Network Management & Rerival

[Time: 3 Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Question number I is compulsory. Solve any three out of remaining.
2. Draw neat diagrams.
3. Illustrations may be given as required.

Q.1 a) What is zoning? Discuss a scenario, **10**

1. where soft zoning is preferred over hard zoning
2. where hard zoning is preferred over soft zoning

b) Seventeen switches, with 16 ports each, are connected in a mesh topology. How many ports are available for host and storage connectivity if you create a high availability solution? **10**

Q.2 (a) Discuss the various factors that affect the NAS performance and availability in detail. **10**

(b) What is meant by seek time, rotational latency and utilization in case of disk drive **10**

Q.3 (a) Explain logical components of connectivity in storage system environment **10**

(b) What is meant by business continuity, information availability, disaster recovery and recovery point objective? **10**

Q.4 (a) Compare the shadow paging recovery scheme with the log-based recovery schemes in terms of ease of implementation and overhead cost. **10**

(b) List the advantages, disadvantages of RAID level 0, 1,5 **10**

Q.5 a) Compare NAS,FCSAN and iSCSI SAN **10**

b) Explain information lifecycle. What are the key challenges in managing information? **10**

Q.6 a) Explain NAS file sharing protocol. **10**

b) Explain the properties information storage and retrieval systems **10**

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