PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2022
(Second Semester)

Branch – COMPUTER SCIENCE

RESOURCE MANAGEMENT TECHNIQUES

Time: Three Hours   Maximum: 50 Marks
SECTION-A (5 Marks)
Answer ALL questions
ALL questions carry EQUAL marks   (5 x 1 = 10)

1   In LPP, _____ represent(s) the mathematical equations of the availability of the resources.
(i) Objective function   (ii) Redundancy
(iii) Constraints   (iv) Decision variable

2   Initial Basic Feasible Solution is the solution which satisfies _____ of the transportation problem.
(i) rim requirements and non-negativity   (ii) rim requirements
(iii) non-negativity   (iv) None of these.

3   Traffic intensity is _____.
(i) $\lambda - \mu$ (ii) $\lambda + \mu$
(iii) μ/λ (iv) λ/μ

4   An activity that does consume neither any resource nor any time is known as

_____.
(i) Predecessor Activity   (ii) Successor Activity
(iii) Dummy Activity   (iv) Activity

5   A mixed strategy game can be solved by _____.
(i) Simplex method   (ii) Hungarian method
(iii) Graphical method   (iv) Degeneracy

SECTION - B (35 Marks)
Answer ALL Questions
ALL Questions Carry EQUAL Marks   (5 x 3 = 15)

6   a   Write down the algorithm for Big-M method of solving an LPP.
                              OR
    b   A firm produces 3 products A, B and C. The profits are Rs.3, Rs.2 and Rs.4 respectively. The firm has 2 machines and below is given the required processing time in minutes for each machine on each product:

Machine	Product			Availability
	A	B	C	
C	4	3	5	2000
D	2	2	4	2500

Formulate the linear programming problem to find the product mix to maximize the profit.

7 a Determine the initial basic feasible solution using least cost method for the following transportation problem:

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	4	5	9	20
Demand	20	40	30	10	

OR

   b Solve the following transportation problem by Vogel's Approximation Method :

Destination

Origin	A	B	C	D	Availability
X	27	23	31	69	150
Y	10	45	40	32	40
Z	30	54	35	57	80
Requirement	90	70	50	60	

8 a Explain briefly the characteristics of waiting line models.

OR

   b Write down the formulas of M/M/1 : N/FIFO model for
      i) expected number of persons in the queue and in the system
      ii) expected waiting time in the queue and in the system

9 a Write down the rules for constructing a network diagram.

OR

   b List the various steps involved in the generation of random numbers.

10 a Suppose two players A and B match coins. If the coins match then A wins two units of value. If the coins do not match, then B wins 2 units of value. Solve the game.   OR

    b State the various types of problems in deterministic inventory models.

SECTION - C (30 Marks)
Answer any ALL Questions
ALL Questions Carry EQUAL Marks   (5 x 6= 30)

11 a Solve the following LPP graphically:

   Min $Z = 2x + y$; Subject to $5x + 10y \leq 50$; $x + y \geq 1$; $x \leq 4$; $x, y \geq 0$.

OR

   b Solve the LPP using simplex method: Max $Z = 10x_1 + x_2 + 2x_3$
      subject to $x_1 + x_2 - 2x_3 \leq 10$; $4x_1 + x_2 + x_3 \leq 20$; $x_1, x_2, x_3 \geq 0$.

12 a Obtain the optimum solution for the transportation problem whose cost matrix is given below:

	D_1	D_2	D_3	D_4	Supply
O_1	19	30	50	10	7
O_2	70	30	40	60	9
O_3	40	8	70	20	18
Demand	5	8	7	14	

OR

12 b Solve the assignment problem whose cost matrix is given below:

Programmer

Program	A	B	C	D
1	10	25	15	20
2	15	30	5	15
3	35	20	12	24
4	17	25	24	20

13 a At a petrol pump, customers arrive according to a Poisson process with an average time of 5 minutes between arrivals. The service time is exponentially distributed with mean time of 2 minutes.
  (i) What would be the average queue length?
  (ii) What would be the average number of customers in the system?
  (iii) What is the average time spent by a car in the petrol pump?
  (iv) What is the average waiting time of a car before receiving petrol?

OR

  b Customers arrive at a post office according to Poisson input process with a mean rate of 30 per day. The time required to serve a customer has an exponential distribution with a mean of 36 minutes. Assume that the customers are served by a single individual, and queue capacity is 9. Find out
    (ii) The probability of no customers in the queue.
    (iii) The average line length.

14 a A project schedule has the following characteristics:
  Activity:1 – 2   1 – 3   1 – 4   2 – 5   3 – 4   3 – 7   4 – 5   4 – 6   5 – 6   5 – 7   6 – 7
  Time : 20   23   8   19   16   24   0   18   0   4   10
    i) Construct network diagram
    ii) Find total float for all the activities
    iii) Compute expected completion time of the project.
    iv) Find the critical path.

OR

  b The following table gives the jobs of a network along with their time estimates:

Jobs	Duration in days		
	t_o	t_m	t_p
1 – 2	5	10	8
1 – 3	18	22	20
1 – 4	26	40	33
2 – 5	16	20	18
2 – 6	15	25	20
3 – 6	6	12	9
4 – 7	7	12	10
5 – 7	7	9	8
6 – 7	3	5	4

    i) Draw the project network diagram.
    ii) Find the length and variance of the critical path.
    iii) Find the probability that the project will be completed within 41.5 days.

15 a Use dominance property to solve the following game:
Player B
$$\text{Player A} \begin{bmatrix} 1 & 7 & 2 \\ 6 & 2 & 7 \\ 5 & 1 & 6 \end{bmatrix}$$

OR

  b The demand for a particular item is 18,000 units per year. The holding cost per unit is Rs.120 per year and the cost of one procurement is Rs.400. No shortages are allowed and the replacement rate is instantaneous. Determine
    i) Optimum order quantity ii) Number of orders per year
    iii) Time between orders iv) Total cost per year when the cost of one unit is Re.1.

Z-Z-Z   END