SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
B.Com.(Honours) - END SEMESTER EXAMINATIONS APRIL - 2023
SEMESTER - II
20UBHCT2007 - Operations Research

Total Duration : 2 Hrs. 30 Mins.   Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30 \text{ Marks})$

1. Explain in detail the merits and demerits of OR.

2. The following table gives the activities of a construction project and duration in days:

Activity	1-2	1-3	2-3	2-4	3-4	4-5
Duration (days)	20	25	10	12	6	10

   Draw the network diagram. Indicate all the possible paths. Sketch the critical path.

3. Compute basic elements of a queuing system.

4. Show the range of values of p and q which will render the entry (2,2) a saddle point for the game:

   Player B

   $$\text{Player A} \begin{bmatrix} 2 & 4 & 5 \\ 10 & 7 & q \\ 4 & p & 8 \end{bmatrix}$$

5. Show the optimal solution for the assignment problem with the following cost matrix.

   Area

		W	X	Y	Z
	A	11	17	8	16
Salesman	**B**	9	7	12	6
	C	13	16	15	12
	D	14	10	12	11

6. Solve and Draw the graphs of the following system of inequalities and indicate the solution set: x + 2y ≥ 4, 3x + y ≥ 6, x = ≤ 6 and y ≤ 5.

Contd...

7. At a service centre, customers arrive at the rate of 10 per hour and are served at the rate of 15 per hour. Their arrival follows Poisson distribution and service is exponentially distributed. Compute the average length and average waiting time in the system.

8. An Executive has to make a decision. He has 4 alternatives D1, D2, D3 and D4. When the decision has been made events may lead, such that any of the four results may occur. The results are R1, R2, R3 & R4. The probabilities of occurrence of these results are as follows:
R1 = 0.5, R2 = 0.2, R3 = 0.2, R4 = 0.1
The payoff values between the decision and the results are given in the following table:

Decision	Results			
	R1	R2	R3	R4
D1	14	9	10	5
D2	11	10	8	7
D3	9	10	10	11
D4	8	10	11	13

Solve this decision situation in the form of a decision - tree and indicate the most preferred decision and corresponding expected value.

Section C

I - Answer any **TWO** questions $(2 \times 10 = 20$ Marks)

9. A manufacturer employees three inputs: man $-$ hours, machine $-$ hours and cloth material to manufacture two types of dresses. Type A dress fetches him a profit of Rs.160 per piece, while type B, that of Rs.180 per piece. The manufacturer has enough man $-$ hours to manufacture 50 pieces of type A or 20 pieces of Type B dresses per day. While the machine $-$ hours he possesses suffice only for 36 pieces of type A or for 24 pieces of type B of dresses. Cloth material available per day is limited but sufficient enough for 30 pieces of either type of dress. Prepare the linear programming model.

10. Substitute an initial basic feasible solution to the following transportation problem, using Vogel's approximation method.

Warehouses	Stores				Availability
	I	II	III	IV	
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	-1	4	2	19
Requirements	21	25	17	17	80

11. A self service store employs one cashier at its counter. Nine customers arrive on an average in every five minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate, evaluate:

   a. Average number of customers in the system.
   b. Average queue length
   c. Average time a customer spends in the system.
   d. Average time a customer waits before being served.

12. In a game matching coins with two players, suppose player A wins one unit of value, when there are two heads, wins nothing when there are two tails and loses ½ unit of value when there are one head and one tail. Compute the pay – off matrix, the best strategies for each player and the value of the game to player A.

<div align="center">II - Compulsory question $(1 \times 10 = 10$ Marks$)$</div>

13. **Case Study Question:**

   Draw a PERT chart and determine critical path, duration of project and slack for non critical activities.

Activities	1-2	2-4	1-3	3-4	3-5	4-5
Duration (days)	3	5	10	6	15	4

<div align="center">******</div>