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.(Hons) - END SEMESTER EXAMINATIONS APRIL - 2022
SEMESTER - II
20UBHCT2007 - Operations Research

Total Duration : 3 Hrs. **Total Marks : 60**

Section A

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

1. A dietician wishes to fix two types of food in such a way that, the vitamin contents of the mixture contains at least 8 units of vitamin-A and 10 units of Vitamin-B. Food-I, contains 2 units per Kg of vitamin-A and 1 unit per Kg of vitamin B. while the Food-II contains 1 unit per Kg of Vitamin and 2 units per Kg of vitamin B. It costs Rs.5 per Kg to purchase Food-I and Rs.8 per Kg of Food-II. Prepare the mathematical model of the problem stated above.
2. Find the minimum cost solution for the following transportation problem which has cost structure as

	To			**Availability**
From	16	19	12	14
	22	13	19	16
	14	28	8	12
Requirement	10	15	17	

3. The following table gives the activities in a construction project and other relative information.

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

   Draw the network for the project
   Find out the critical path and the project duration
   Find the total float for each activity.

4. From the following activities of a project PERT time estimates draw network diagram and project completion time along with variance.

JOB	**Optimistic time**	**Most likely time**	**Pessimistic time**
1-2	3	6	15
7-8	4	19	28
2-3	6	12	30
3-5	5	11	17
5-8	1	4	7
6-7	3	9	27
4-5	3	6	15
2-4	2	5	8
1-6	2	5	14

Contd...

5. For a period of Two hours in a day (8 to 10am) trains arrive at the yard every 20 minutes but the service time continues to remain 36 minutes. Then calculate for this period,
   1. The probability that the yard is empty.
   2. The average number of trains in the system, on the assumption that the line capacity of the yard is limited to 4 trains only.

6. Solve the game, whos pay matrix is as follows

		Player-2		
		X	**Y**	**Z**
Player-1	**A**	5	7	5
	B	4	0	1
	C	5	9	3

7. Mark the feasible regions represented by constraints in equations

   $X_1+X_2 \leq 1$
   $3X_1+X_2 \geq 3$
   $X_1,X_2 \geq 0$
   Of the linear optimising function $Z= X_1+X_2$

8. Describe the following a) Constraints b) Optimal solution.

Section B

Part A

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

9. Explain the procedure to solve a LPP problem using Simplex Method.

10. Solve the following transportation problem using VAM method.

	S1	**S2**	**S3**	
W1	5	4	3	6
W2	4	7	6	8
W3	2	5	8	12
W4	8	6	7	4
	8	10	12	20

Contd...

11. The activities of a project and their time estimates are given below:

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	2	5	8
1-4	4	19	28
1-5	5	11	17
2-3	3	9	27
2-6	3	6	15
3-6	2	5	14
4-6	3	6	15
5-7	1	4	7
5-8	2	5	14
6-8	6	12	30
7-8	2	5	8

Find out mean time and SD of the duration of the activity, critical path, calculate slacks and find out the SD of critical path.

12. A car park contains 5 cars. The arrival of cars is poisson at a mean rate of 10 per hour. The length of time each car spends in the car park has negative exponential distribution with means of 12 hours. How many cars in the car park on average and what is the probability that, a newly arriving customer find the car park full and having to park his car elsewhere?

Part B

Compulsory question $(1 \times 10 = 10$ Marks)

13. Following is the payoff matrix for player –A, find out the value of the game by using dominance property rule.

		Player-B				
		B1	**B2**	**B3**	**B4**	**B5**
Player-A	**A1**	2	4	3	8	4
	A2	5	6	3	7	8
	A3	6	7	9	8	7
	A4	4	2	8	4	2

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