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.(A&F) END SEMESTER EXAMINATIONS NOVEMBER-2022
SEMESTER - II
20UAFAT2002 - Operations Research

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

Section A

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

1. Explain the Scope of Operations Research.

2. A farmer has 1,000 acres of land on which he can grow corn, wheat or soya beans. Each acre of corn costs Rs.100 for preparation, requires 7 man-days of work and yields a profit of Rs.30. An acre of wheat costs Rs.120 to prepare, requires 10 man-days of work and yields a profit of Rs.40. An acre of soya beans costs Rs.70 to prepare, requires 8 man-days of work and yields a profit of Rs.20. If the farmer has Rs.1,00,000 for preparation and can count on 80,000 man-days work, formulate the mathematical model.

3. Solve the following transportation problem by Vogel's Approximation method.

	A	**B**	**C**	$\mathbf{a}_i$
$\mathbf{F}_1$	10	9	8	8
$\mathbf{F}_2$	10	7	10	7
$\mathbf{F}_3$	11	9	7	9
$\mathbf{F}_4$	12	14	10	4
$\mathbf{b}_i$	10	10	8	

4. Find the Optimal solution for the assignment problem with the following cost matrix.

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

5. The following data are the characteristics of a project

Activity	**Immediate predecessors**	**Duration in days**
A	-	2
B	A	3
C	A	4
D	B,C	6
E	-	2
F	E	8

i) Draw the network diagram for the above project.
ii) Find the minimum project completion time and the critical path.

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6. 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:	20	25	10	12	6	10

Draw the network diagram and find the Critical Path.

7. What are the characteristics of Queuing Model?

8. A TV repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hour day then

(i) How many jobs are ahead of the set just brought in?

(ii) What is the repairman's expected idle time each day?

Section B

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Solve the following problem using Simplex Method.

Maximize $Z = 21X_1 + 15X_2$

Subject to the constraints $-X_1 - 2X_2 \geq -6$

10. Obtain an Optimal basic feasible solution to the transportation problem.

		Warehouse				Factory
		W1	W2	W3	W4	Capacity
	F1	19	30	50	10	7
Factory	F2	70	30	40	60	9
	F3	40	8	70	20	18
Required		5	8	7	14	

11. Solve the following unbalanced assignment problem of minimizing total time for doing all the jobs.

	Job				
Operator	1	2	3	4	5
1	6	2	5	2	6
2	2	5	8	7	7
3	7	8	6	9	8
4	6	2	3	4	5
5	9	3	8	9	7
6	4	7	4	6	8

12. A Project consists of tasks A, B, C, D....I with the conditions A≤D & E; B, D≤F; C≤G; B≤H; F, G≤I. Task and time taken are given below:

Task :	A	B	C	D	E	F	G	H	I
Time (days) :	23	8	20	16	24	18	19	4	10

Draw the network and determine the critical path and project duration.

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13. Western National Bank is considering operative a drive-in window for customer service. Management estimates that the customers will arrive for service at the rate of 15 per hour. The teller whom it is considering to staff the window can service customers at the rate of one every three minutes. Assuming Poisson arrivals and exponential service time, find
    (i) utilisation of the teller.
    (ii) average number in the waiting line.
    (iii) average number in system.
    (iv) average waiting time in line.
    (v) average waiting time in the system.

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