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 APRIL-2022
SEMESTER - II
20UAFAT2002 - Operations Research

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

Section A

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

1. What are the different models in Operations Research & explain its advantages?
2. A dealer wishes to purchase a number of fans and sewing machines. He has only Rs.5,760 to invest and has space utmost for 20 items. A fan costs him Rs.360 and a sewing machine Rs.240. His expectation is that he can sell a fan at a profit of Rs.22 and a sewing machine at a profit of Rs.18. Assuming that he can sell all the items that he can buy, how should he invest this money in order to maximize his profit? Formulate this problem as a Linear programming problem and then use graphical method to solve it.
3. The following table gives the activities in a construction project and other relevant information.

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

   (i) Draw the network for the project.
   (ii) Find the Critical Path and Project Duration.
   (iii) Find the Total float for each Activity.
4. What is a Linear Programming Problem? Summarise the procedure for the graphical solution to a linear programming problem.
5. Solve the following transportation problem:

	D_1	**D_2**	**D_3**	**D_4**	**Availabilities**
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	2	2	1	10
Requirement	4	6	8	6	24

6. Mention the Characteristics of a Queuing Model.

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7. On an average 96 patients arrive in an emergency clinic which works for 24 hours a day. Also on an average a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time.
   Suppose that it costs the clinic Rs.100 per patient and each minute of decrease in the average service time of 10 minutes would cost the clinic Rs.10 more patient. How much would have to be budgeted by the clinic to decrease the average size of the queue to half?

8. Solve the given linear programming problems graphically:
   Maximize: $Z = 8x + y$ and the constraints are :
   $x + y \leq 40$,
   $2x + y \leq 60$,
   $x \geq 0$, $y \geq 0$

Section B

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

9. The ABC manufacturing company makes two products P1 and P2. Each of the products requires time on cutting machine and a finishing machine. Relevant data are:

	Product	
	P1	**P2**
Cutting hours (per unit)	2	1
Finishing hours (per unit)	3	3
Profit per unit	Rs.6	Rs.4
Maximum Sales (unit per week)	-	200

   The number of cutting hours available per week is 3900 and number of finishing hours available per week is 810.
   How much should be produced of each product in order to achieve maximum profit for the company?

10. Find the minimum cost solution for the following transportation problem which has cost structure as:

		To		**Availabilities**
	16	19	12	14
From	22	13	19	16
	14	28	8	12
Requirements	10	15	17	

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11. Alpha Corporation has four plants each of which can manufacture any one of four products. Production costs differ from one plant to another as do sales revenue. Given the revenue and cost data below, obtain which product each plant should produce to maximize profit:

	Sales Revenue (Rs.000s)				**Production Costs (Rs.000s)**			
	Product				**Product**			
Plant	1	2	3	4	1	2	3	4
A	50	68	49	62	49	60	45	61
B	60	70	51	74	55	63	45	69
C	55	67	53	70	52	62	49	58
D	58	65	54	69	55	64	48	66

12. A Small project consists of all activities A, B . . . K. The precedence relationship are A<C, D, I, B<G, F; D<G,F; F<H, K, G, H<J; I, J, K< E. The duration of the activities are as follows:

Activity	A	B	C	D	E	F	G	H	I	J	K
Duration Days)	5	3	10	2	8	4	5	6	12	8	9

Draw the network of the project, Summarize the CPM calculations in a tabular form, computing total and free floats of activities and hence determine the critical path.

13. The secretary of a School is taking bids on the city's four school bus routes. Four companies have made the bids as detailed in the following table.

Co	**Route 1**	**Route 2**	**Route 3**	**Route 4**
	Rs.	**Rs.**	**Rs.**	**Rs.**
1	4,000	5,000	-	-
2	-	4,000	-	4,000
3	3,000	-	2,000	-
4	-	-	4,000	5,000

Suppose each bidder can be assigned only one route. Use the assignment model to minimize the School's cost of running the four bus routes.

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