

CODE: 196021  
NOVEMBER 2020

TIME: 2 Hrs  
MAX. MARKS: 50

24. Consider a problem of assigning four clerks to four tasks, the times (hours) required to complete the tasks are given below:

	Tasks			
Clerks	A	B	C	D
1	4	7	5	6
2	-	8	7	4
3	3	-	5	3
4	6	6	4	2

Clerk 2 cannot be assigned to task A and Clerk 3 cannot be assigned to task B. Find the optimum assignment schedules.

25. A project is as follows:

Activity	Duration	Preceding activity
A	4	-
B	9	-
C	3	A
D	8	B
E	7	B
F	2	D
G	5	E

Construct the network and find the project and critical path duration.

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**PART A**  
*Answer any **TEN** questions.* (10 x 2=20)

1. What is a Model?
2. What is a symbolic model?
3. What are decision variables?
4. What is a Transportation problem?
5. What is a Basic solution?
6. What is an Assignment problem?
7. What is a balanced TP?
8. What is an optimal solution?
9. What is PERT?
10. What do you mean by Independent Float?
11. What do you mean by the pessimistic time estimate?
12. What is EFT?

**PART B**  
*Answer any **TWO** questions.* (2 x 5=10)

13. List out the characteristics of Symbolic Model.
14. A dietician wishes to mix 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 A and 2 units per kg of vitamin B. It costs ₹5 per kg to purchase food I and ₹8 per kg to purchase food 2. Prepare a mathematical model for the problem stated above.
15. A dealer wishes to purchase a number of fans and sewing machines. He has only ₹5760 to invest and has space atmost for 20 items, A fan costs him ₹360 and a sewing machine ₹240. His expectation is that he can sell a fan at a profit of ₹22 and a sewing machine at a profit of ₹18. Assuming tha he can sell all the items that he can buy, how should he invest this money in order to maximise his profit? Formualate this problem as a linear programming problem and then use graphical method to solve it.

16. Solve the following transportation problem:

	A	B	C	A1
F1	10	9	8	8
F2	10	7	10	7
F3	11	9	7	9
F4	12	14	10	4
B1	10	10	8	

17. A Company has 3 plants P1,P2, P3 each producing 50,100 and 150 units of a similar product. There are five warehouses W1,W2,W3,W4 and W5 and having demand of 100,70,50,40 and 40 units respectively. The cost of sending a unit from various plants to the warehouses differs as given by the cost matrix below: Determine a transportation schedule so that the cost is minimised.

	W1	W2	W3	W4	W5	A1
P1	20	28	32	55	70	50
P2	48	36	40	44	25	100
P3	35	55	33	45	48	150
B1	100	70	50	40	40	

18. In a textile emporium, four salesmen A, B C and D are available to handle four counters W, X, Y snf Z. Each salesman can handle any counter. The service time in hours of each counter when manned by each salesman is given below:

Counters	Salesmen				
		A	B	C	D
	W	41	22	39	52
	X	22	29	40	65
	Y	27	39	60	51
	Z	45	50	48	52

How should the salesmen be allocated to appropriate counters so as to minimise the total service time? Each salesmen should handle only one counter.

19. A project has the following time schedule:

Activity	Time in months	Activity	Time in months
1-2	2	3-7	5
1-3	2	4-6	3
1-4	1	5-8	1
2-5	4	6-9	5
3-6	8	7-8	4
		8-9	3

- i) Construct the network
- ii) Find the total float for each activity
- iii) Find the critical path and project duration.

20. A project has 14 activities A through M. the relationships which obtain among these activities are given below: Construct the network and number them.  
A is the operation  
B and C can be performed in parallel and are immediate successor to A.  
D,E and F follow B  
G follows E  
H follows D, but it cannot start until E is completed.  
I and J succeed G.  
F and J precede K.  
M succeeds L and K.  
The last operation N succeeds M and C.

PART C (2 x 10=20)  
Answer any TWO questions.

21. A firm buys castings of P and Q type of parts and sells them as finished product after machinery, boring and polishing. The purchasing cost for castings are ₹3 and ₹4 each for parts P and Q and selling costs are ₹8 and ₹10 respectively. The per hour capacity of machines used for machinery, boring and polishing for two products is given below:

Capacity per hour	Parts	
	P	Q
Machinery	30	50
Boring	3	45
Polishing	45	30

The running costs for machinery, boring and polishing are ₹30, ₹22.5 and ₹22.5 respectively. Formulate the linear programming problem to find out the product mix to maximise the profit.

22. An animal feed company must produce 200 kgs of a mixture consisting of ingredients X<sub>1</sub> and X<sub>2</sub> daily. X<sub>1</sub> costs ₹3 per kg and X<sub>2</sub> ₹8 per kg. Not more than 80 kgs of X<sub>1</sub> can be used and atleast 60 kgs of X<sub>2</sub> must be used. Find how much of each ingredient should be used if the company wants to minimise cost.

23. Consider the following transportation cost table. The costs are given in ₹The supply and demand are in units. Determine an optimal solution.

Source	Restriction					supply
	1	2	3	4	5	
I	40	36	26	38	30	160
II	38	28	34	34	198	280
III	36	38	24	28	30	240
Demand	160	160	200	120	240	