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M. B. A. (Third Semester) Examination,
April-May 2020/ NOV-DEC 2020

(New Scheme)

(Specialization : General)

(Management Branch)

OPTIMIZATION METHODS (NEW)

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 32

Note : *Question paper consist of 5 units. Part (a) is compulsory in each unit. Attempt any one from (b) and (c) from each unit. In every unit question (a) of 2 marks and (b) and (c) are of 14 marks.*

Unit-I

1. (a) What are the limitations of LPP?

    (b) Anita electric company produces two products P_1 and P_2 that are produced and sold on weekly basis.

The weekly production can not exceed 25 for product P_1 and 35 for product P_2 because of limited facilities. The company employs total of 60 workers. Product P_1 requires 2 man weeks of labour, where as product P_2 requires only 1. Profit margin on P_1 is Rs. 60 and P_2 is Rs. 40. Formulate it as a LPP and solve for maximum profit.

(c) An Air Force is experimenting with three types of bombs P, Q and R in which three kinds of explosives viz. A, B and C will be used. Taking the various factors into account, it has been decided to use the maximum 600 kg of explosive A, at least 480 kg of explosive B and exactly 540 kg of explosive C. Bomb P requires 3, 2, 2 kg bomb Q requires 1, 4, 3 kg and bomb R requires 4, 2, 3 kg of explosives A, B and C respectively. Bomb P is esitmated to give the equivalent of a 2 ton explosion, bomb Q, a 3 ton explosion and bomb R, a 4 ton explosion respectively. Under what production schedule can the Air Force make the biggest bang? Formulate the above as a linear programming problem and solve it through simplex method.

Unit-II

2. (a) What do you mean by degeneracy in transportation problem?

(b) ABC limited has three production shops supplying a product to five warehouses. The cost of production varies from shop to shop and cost of transportation from one shop to a warehouse also varies. Each shop has a specific production capacity and each warehouse his certain amount of requirement. The costs of transportation are given below :

Warehouse

		I	II	III	IV	V	Supply
	A	6	4	4	7	5	100
Shop	B	5	6	7	4	8	125
	C	3	4	6	3	4	175
	Demand	60	80	85	105	70	400

The cost of manufacturing the product at different production shops is :

Shop	Variable Cost	Fixed Cost
A	14	7,000
B	16	4,000
C	15	5,000

Find the optimum quantity to be supplied from each shop to different warehouses at minimum total cost.

(c) A product is produced by four factories A, B, C and D. The unit production costs in them are Rs. 2, Rs. 3 Re. 1 and Rs. 5 respectively. Their production capabilities are factory A-50 units, B-70 units, C-30 units and D-50 units. These factories supply the product to four stores, demands of which are 25, 35, 105 and 20 units respectively. Unit transport cost in rupees from each factory to each store is given table below :

		Stores			
		1	2	3	4
	A	2	4	6	11
Factories	B	10	8	7	5
	C	13	3	9	12
	D	4	6	8	3

Determine the extent of deliveries from each of the factories to each of the stores so that the total production and transportation cost is minimum.

Unit-III

3. (a) What is travelling salesman problem?

(b) A manufacturer of complex electronic equipment has just received a sizable contract and plans to subcontract part of the job. He has solicited bids for 6 subcontracts from 3 firms. Each job is sufficiently large and any firm can take only job. The table below shows the bids as well as the cost estimates (in lakhs of rupees) for doing the job internally. Not more than three jobs can be performed internally :

Job Firm	1	2	3	4	5	6
1	44	67	41	53	48	64
2	46	69	40	45	45	68
3	43	73	37	51	44	62
Internal	50	65	35	50	46	63

Find the optimal assignment that will result in minimum total cost.

(c) A fast-food chain wants to build four stores. In the past the chain has used six different construction companies, and having been satisfied with each, has invited them to bid for each job. The final bids (in thousands of rupees) are shown in the following table :

Construction companies

Stores		1	2	3	4	5	6
	1	85·3	90	87·5	82·4	89·1	91·3
	2	78·9	84·5	99·4	80·4	89·3	88·4
	3	82·0	31·3	28·5	66·5	80·4	109·7
	4	84·3	34·6	86·2	83·3	85·0	85·5

Since the fast-food chain wants to have each of the new stores ready as quickly as possible, it will allot at most one job to a construction company. What assignment will result in the minimum total cost?

Unit-IV

4. (a) What do you mean by sequencing problem?

(b) Consider a self-service store with one cashier. Assume Poisson arrivals and exponential service time. Suppose that nine customers arrive on the average every 5 minutes and the cashier can serve 10 in 5 minutes.

Find :

(i) average number of customers queuing for service

(ii) probability of having more than 10 customers in the system, and

(iii) probability that a customer has to queue for more than 2 minutes.

If the service can be speed up to 12 in 5 minutes by using a different cash register, what will be the effect on the quantities (i), (ii) and (iii).

(c) A warehouse has only one loading dock manned by a three person crew. Trucks arrive at the loading dock at an average rate of 4 trucks per hour and the arrival rate is Poisson distributed. The loading of a truck takes 10 minutes on an average and can be assumed to be exponentially distributed. The operating cost of a truck is Rs. 20 per hour and the members of the loading crew are paid @ Rs. 6 each per hour. Would you advise the truck owner to add another crew of three persons?

Unit-V

5. (a) Explain the following terms :

(i) Optimistic time

(ii) Pessimistic time

(b) A small project consists of seven activities for which the relevant data is given below :

Activity	Preceding activities	Duration (days)
A	—	4
B	—	7
C	—	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

(i) Draw the network and find the project completion time.

(ii) Calculate the three floats for each activity

(c) Determine the optimum project duration and cost for the following data :

Activity	Normal		Crash	
	Time (days)	Cost (Rs)	Time (days)	Cost (Rs)
1-2	8	100	6	200
1-3	4	150	2	350
2-4	2	50	1	90
2-5	10	100	5	400
3-4	5	100	1	200
4-5	3	80	1	100

Indirect cost is Rs. 70 per day.