Exam.Code:0502
Sub. Code: 3817

2071
Master of Commerce, Second Semester
MC-205: Operations Research
(Same for USOL candidates)

Time allowed: 3 Hours Max. Marks: 80

NOTE: *Attempt five questions in all, selecting atleast one question from each Unit.*

x-x-x

UNIT – I

I. What are the assumptions of linear programming? What do you mean by infeasibility and unboundedness in linear programming? State applications of LPP in business. (16)

II. Three types of dolls (D1, D2 and D3) manufactured by a toy maker generates a profit of Rs.10, 13 and 11 respectively. Because of the constraints of labour and machine time available only a limited quantity of dolls can be manufactured which was estimated to be 16000 of Dl, 25000 of D2 and 12000 of D3. To manufacture such quantity labour time per unit required was calculated to be 0.3, 0.5 and 0.34 minutes whereas machine time was 0.03, 0.045 and 0.03 minutes for dolls Dl, D2 and D3 respectively. Maximum labour time and machine time available to fulfill the mentioned demand were 9000 minutes and 11,000 minutes. All the three type of dolls undergo same process for manufacturing. The manager would like to find combination of number of dolls of each type that could be manufactured under given constraints that would maximize profits. (16)

III. *Maximize* $Z = 4x_1 + 4x_2$

Subject to:
$$5x_1 + 10x_2 = 20$$
$$10x_1 + 1x_2 >= 10$$
$$x_1, x_2 >= 0$$

a) Construct the dual form.

b) Solve only primal by simplex method and identify basic solution at each iteration. Also identify complementary dual solution from primal.

c) Identify basic and non-basic variables of dual problem.

d) Determine whether primal and dual has a feasible and optimal solution. (16)

P.T.O.

UNIT - II

IV. Consider the given transportation table and:

	Dl	D2	D3	D4	*Supply*
S1	6	8	11	6	***100***
S2	7	6	9	3	***250***
S3	7	7	10	8	***125***
S4	9	6	15	5	***150***
Demand	**150**	**125**	**200**	**150**	

a) Formulate LPP of given transportation problem.

b) Signify the importance of VAM method over least cost method by finding initial feasible solution.

c) Find optimal solution of minimum initial cost solution obtained in (a).

d) If supply of source S2 is reduced to 200 units because of some production constraint how initial solution changes? Find by using least cost method. (16)

V. Consider the given transportation table and:

	Dl	D2	D3	*Supply*
S1	5	11	7	200
S2	9	17	7	400
S3	15	19	11	400
Demand	300	400	300	

a) Use North-West Corner and Least Cost method to find initial solution.

b) Find most optimal solution of the minimum initial solution.

c) How solution would change if minimum of 200 units have to be routed through S3-D3 route. (16)

VI. Explain the concept of sub-tours and illustrate them by solving following travelling salesman problem:

	A	B	C	D	E
A	∞	6	12	16	4
B	14	∞	8	12	6
C	18	16	∞	10	16
D	26	10	14	∞	12
E	4	8	6	18	∞

(16)

UNIT - III

VII. For the following project estimate total project cost under normal times and crash times. Indirect cost is Rs.100 per day.

Activity		Normal		Crash	
	Predecessor	Time (days)	*Cost* (Rs. 000)	Time (days)	Cost (Rs. 000)
A	—	8	100	6	200
B	—	4	150	2	350
C	A	2	50	1	90
D	A	10	100	5	400
E	B	5	100	1	200
F	C,E	3	80	1	100
		Total	580		

(16)

VIII. A project has been defined to contain the following activities, along with their time estimates

Activity	Time estimates (week)			
	Optimisti	Most likely	Pessimistic	Predecessor
A	1	4	7	-
B	2	6	7	A
C	3	4	6	A,D
D	6	12	14	A
E	3	6	12	D
F	6	8	16	B,C
G	1	5	6	E,F

a) Draw the critical path diagram

b) Show the early start, early finish, late start and late finish times.

c) What is the probability that the project can be completed in 34 weeks? (16)

UNIT - IV

IX. A grocery store has a small adjacent parking lot with three parking spaces reserved for the store's customers. During store hours when the lot is not full cars enter the lot and use one of spaces at a mean rate of two per hour. When the lot is full the arriving cars leave and do not return. For n=0,l,2,3 probability that exactly n spaces currently are being used is 0.2, 0.3, 0.3 and 0.2 respectively.

a) Describe how this parking lot can be interpreted as being a queuing system. In particular, identify the customers and the servers. What is the service being provided? What constitutes a service time? What is the queue capacity?

b) Determine the basic measures of performance for this queuing system.

c) Determine the average length of time that a car remains in a parking space. (16)

X. Explain:

a) Minimax and Maximin principle used in game theory.

b) What is a saddle point? Does every game necessarily possess a saddle point?

c) Solve the following game by using graphical method

		Player - B	
		I	II
Player - A	I	2	7
	II	3	5
	III	11	2

(16)

x-x-x