Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA Integrated- SEMESTER– IV• EXAMINATION – SUMMER 2017

Subject Code: 4440602 **Date:09/05/2017**

Subject Name: Operations Research

Time: 10.30 AM TO 01.00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Provide Alternate Solutions wherever applicable.**

Q.1 **(a)** What is LPP? Discuss in brief components of an LPP. Also give its limitations. **07**

(b) Define: Operations Research. Discuss briefly features of OR. Also mention application area of OR. **07**

Q.2 **(a)** A manufacturer produces two different models, X and Y of the same product. The raw materials R1 and R2 are required for production. At least 18 kg of R1 and 12 kg of R2 must be used daily. Also at most 34 hours of labour is to be utilized. 2 kg of R1 is needed for model X and 1 kg of R1 is required for model Y. For each model of X and Y, 1 kg of R2 is required. It takes 3 hours to Manufacture a model X and 2 hours to manufacture a model Y. The profit is Rs.50 for each model X and Rs. 30 for each model Y. How many units of each model should be produced to maximize the profit? Formulate this problem as an LP model. **07**

(b) Solve the following LPP using Simplex Method. **07**

Max $Z = x_1 + 4x_2 + 5x_3$

Subject to the Constraints

$3x_1 + 3x_2 \leq 22$

$x_1 + 2x_2 + 3x_3 \leq 14$

$3x_1 + 2x_2 \leq 15$

& $x_1, x_2, x_3 \geq 0$

OR

(b) Solve the following LPP using Simplex Method. **07**

Max $Z = 3x_1 + 2x_2$

Subject to the Constraints

$2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$

& $x_1, x_2 \geq 0$

Q.3 **(a)** Define: Pay-off Matrix, Saddle point. **07**
Determine the best strategies for players A and B and the value of the game. Is this game (i) fair? (ii) strictly determinable?

Player A	Player B			
	B_1	B_2	B_3	B_4
A_1	3	−5	0	6
A_2	−4	−2	1	2
A_3	5	4	2	3

(b) Determine an initial feasible solution to the following transportation problem by using (i) NWCM, (ii) LCM, and (iii) VAM. **07**

	Destination				
Source	D1	D2	D3	D4	Supply
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

OR

Q.3 **(a)** Consider a problem of assigning four clerks to four tasks. The time(hours) required to complete the task is given below: **07**

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

(b) A machine operator has to perform three operations, turning, threading and knurling on a number of different jobs. The time required to perform these operations (in minutes) for each job is known and is given below: **07**

Jobs	1	2	3	4	5	6
Time for turning	3	12	5	2	9	11
Time for threading	8	6	4	6	3	1
Time for knurling	13	14	9	12	8	13

Determine the order in which the jobs should be processed in order to minimize the total time required to turn out all the jobs.

Q.4 **(a)** A manufacturer has to supply his customer with 600 units of his product per year. Shortages are not allowed and the storage cost amounts to Rs 0.60 per unit per year. The set up cost per run is Rs 80.00. Find the Optimum run size and the minimum average yearly cost. **07**

(b) What is simulation? State advantages and disadvantages of simulation. **07**

OR

Q.4 **(a)** Define: Inventory. Explain in detail various Costs involved in Inventory. **07**

(b) Consider a self-service store with one cashier. Assume Poisson arrivals and exponential service times. Suppose that on average nine customers arrive every 5 minutes and that the cashier can serve 10 in 5 minutes. Find: **07**
(a) Average number of customers in the system.
(b) Average number of customers queuing for service.
(c) Average waiting time of customer in the system.
(d) Average waiting time of customers in the queue.
(e) Probability of no customers in the system.

Q.5 **(a)** The initial cost of a machine is Rs. 30,000 and running or operating expenditure which increases with age of the machine is given below: **07**

Year	1	2	3	4	5	6	7
Running Cost(Rs.)	5000	6000	8000	10000	13000	16000	20000

What is the replacement policy? When this machine should be replaced? It is given that the rate of interest is 10% and scrap value is nil.

(b) The following maintenance job has to be performed periodically on the heat exchanges in a refinery: **07**

Task	Immediate Predecessor	Time(Days)
A	----	14
B	A	22
C	B	10
D	B	16
E	B	12
F	C	10
G	C	6
H	F,G	8
I	D,E,H	24
J	I	16

(a) Draw a network diagram of activities for the project.
(b) Identify the critical path. What is its length?
(c) Find the total float and free float for each non-critical activities

OR

Q.5 **(a)** 1) Give the difference between PERT and CPM.(Minimum 5) **05**
2) What do you mean by Replacement and Total Elapsed Time. **02**

(b) A firm is considering the replacement of a machine, whose cost price is Rs 12,200, and its scrap value is Rs 200. From experience the running (maintenance and operating) costs are found to be as follows: **07**

Year	1	2	3	4	5	6	7	8
Running Cost(Rs.)	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced ?

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