Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER– IV• EXAMINATION – WINTER - 2017

Subject Code: 2640003 Date: 02-01-2018

Subject Name: Operations Research

Time: 02:30 pm to 05:00 pm Total Marks: 70

Instructions:

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

Q.1 **(a)** What is Linear Programming? What are its major assumptions & limitations? **07**

(b) i) What is Replacement? Give some real-life replacement situations. **03**

ii) Define : Saddle Point, Inventory, Infeasible solution, Unbounded Solution **04**

Q.2 **(a)** a) Do as Directed: **04**

1. Distinguish between Transportation Problem & Assignment Problem
2. Errors & Dummies in Network.

b) For what value of λ, the game with following pay-off matrix is strictly determinable? **03**

	Player B			
Player A		B1	B2	B3
	A1	Λ	6	2
	A2	-1	λ	-7
	A3	-2	4	λ

(b) Solve the following LP problem using Simplex method. **07**

Maximize Z = 16x1 + 17x2 + 10x3

S.T.C.

(i) x1 + x2 + 4x3 ≤ 2000

(ii) 2x1 + x2 + x3 ≤ 3600

(iii) x1 + 2x2 + 2x3 ≤ 2400

(iv) x1≤30

& x1, x2, x3 ≥ 0

OR

(b) Use Big-M Method to solve the following LP Problem **07**

Max Z = $2x_1 + 3x_2 + 4x_3$

S.T.C.

$3x_1 + x_2 + 4x_3 \leq 600$

$2x_1 + 4x_2 + 2x_3 \geq 480$

$2x_1 + 3x_2 + 3x_3 = 540$

& $x_1, x_2, x_3 \geq 0$

Q.3 **(a)** Determine an initial basic feasible solution to the following transportation Problem using i) NWCM ii) LCM iii) VAM **07**

Source	Destination				
	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

(b) Determine the optimal sequence of jobs that minimized elapsed time, based on the following information. Processing time on machines is given in hours and passing is not allowed. **07**

Job	A	B	C	D	E	F	G
Machine -1	3	8	7	4	9	8	7
Machine - 2	4	3	2	5	1	4	3
Machine - 3	6	7	5	11	5	6	12

OR

Q.3 **(a)** A book binder has one printing press, one binding machine and manuscripts of a number of books. The time required for performing the printing and binding operations on each book are shown below. The binder wishes to determine the order in which the book should be processed, so that the total time required to process all books is minimized **07**

Book	1	2	3	4	5	6
Printing Time(in minutes)	30	120	50	20	90	110
Binding Time(in minutes)	80	100	90	60	30	10

(b) A large oil company operating a number of drilling platforms in the North Sea is forming a high speed rescue unit in order to cope with emergency situations that may occur. The rescue unit comprises 6 personnel who, for reasons of flexibility, undergo the same comprehensive training program. The Six personnel are assessed as to their suitability for various specialist tasks and the marks they received in the training program are given in the following table: **07**

	Trainee Number					
Special Task	I	II	III	IV	V	VI
T1	21	5	21	15	15	28
T2	30	11	16	8	16	4
T3	28	2	11	16	25	25
T4	19	16	17	15	19	8
T5	26	21	22	28	29	24
T6	3	21	21	11	26	26

Based on the Marks awarded, What role should each of the trainees be given in the rescue unit?

Q.4 **(a)** Discuss in detail various types of Inventory. **07**

(b) Customers arrive at a sales counter manned by single person according to a Poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of a customer in system and in queue. **07**

OR

Q.4 **(a)** Describe the characteristics of calling population (input source) of a queuing system. What do you understand by Queue discipline? **07**

(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?

Q.5 **(a)** What is simulation? What are the advantages & disadvantages of it. **07**

(b) The precedence relationships of the activities, and activity time estimates (in Days) of a project is as follows: **07**

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M
Predecessors	--	A	B	A	D	E	--	G	J,H	--	A	C,K	I,L
Duration(days)	6	4	7	2	4	10	2	10	6	13	9	3	5

a) Draw the network diagram for this project.
b) Also find the Critical Path & Project Length.

OR

Q.5 **(a)** Define: Operations Research, Pay-off Matrix. Distinguish between PERT & CPM. **07**

(b) A factory needs 1500 units of 6" bar (raw material) every month. The cost of one such bar is Rs 28. Ordering cost per order is Rs 150. The inventory carrying cost is 0.2 fraction of a rupee per year. Find the following **07**

1. EOQ
2. Total inventory cost per year.
3. Number of orders per year.

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