Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER– IV• EXAMINATION – WINTER 2016

Subject Code: 640003 **Date:24/10/ 2016**

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.**

Q.1 **(a)** Define operation research. Discuss briefly the application areas of operations research. **07**

(b) Obtain the dual of the following primal LP problem: **07**

Minimize $Z = 2x1 + 5x2+6x3$
Subject to the constraints
$5x1 + 6x2-x3 \geq 3$
$-2x1 + x2 + 4x3 \geq 4$
$x1 – 5x2 + 3x3 \geq 1$
$-3x1 - 3x2 + 7x3 \geq 6$
$3x1 + 7x2 - 4x3 \leq 10$
and $x1, x2, x3 \geq 0$.

Q.2 **(a)** Solve the following LP problem graphically. **07**

Max $Z= 0.50x2 – 0.10x1$.
Subject to the constraints
$2x1 + 5x2 \leq 80$
$x1 + x2 \leq 20$
and $x1, x2 \geq 0$.

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

Maximize $Z = 3x1 + 2x2 + 5x3$
subject to the constraints
$x1 + 2x2 + x3 \leq 430$
$3x1 + 2x2 \leq 460$
$x1 + 4x2 \leq 420$
and $x1, x2, x3 \geq 0$.

OR

(b) The manufacturer of patent medicines is proposed to prepare a production plan for medicines A and B. There is sufficient ingredient available to make 20,000 bottles of medicine A and 40,000 bottles of medicine B. But there are only 45,000 bottles into which either of the medicines can be filled. Further, it takes three hours to prepare enough material to fill 1000 bottles of medicine A and one hour to prepare enough material to fill 1000 bottles of medicine B, and there are 66 hours available for this operation. The profit is Rs. 8 per bottle for medicine A and Rs. 7 per bottle for medicine B (DO NOT SOLVE). **07**

Q.3 **(a)** Solve the following LP problem using Big-M method : **07**

Maximize $Z = x1 + 2x2 + 3x3 – x4$
subject to the constraints
$x1 + 2x2 + 3x3 = 15$
$2x1 + x2 + 5x3 = 20$
$x1 + 2x2 + x3 + x4 = 10$
and $x1, x2, x3, x4 \geq 0$.

(b) A company management and the labor association are a three years settlement. Each of these has 4 strategies. **07**

I : Hard and aggressive bargaining
II : Reasoning and logical approach
III : Legalistic strategy
IV : Conciliation approach

Union Strategies	Company Strategies			
	I	II	III	IV
I	20	15	12	35
II	25	14	8	10
III	40	2	10	5
IV	-5	4	11	0

OR

Q.3 **(a)** Determine the initial basic feasible solution to the following transportation problem. **07**

(I) NWCM
(II) Vogel's Approximation Method.

Sources	Distribution Centers					Supply
	D1	D2	D3	D4	D5	
S1	2	11	10	3	7	4
S2	1	4	7	2	1	8
S3	3	9	4	8	12	9
Requirement	3	3	4	5	6	21

(b) Discuss the various types of inventories in detail. **07**

Q.4 **(a)** Explain the following terms: Events, Activities, Looping and Dangling in network analysis. **07**

(b) Solve the following assignment problem: How should the task is allocated, one man, so as to minimize the total man-hours? **07**

Task	Men			
	I	II	III	IV
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

OR

Q.4 **(a)** Draw the network diagram for the following activities and find the critical Path and total float. **07**

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

(b) What is Simulation? What are the advantages and disadvantages of Simulation? **07**

Q.5 **(a)** Explain the difference between PERT and CPM. **07**

(b) In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter arrival time fallow an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average of 36 minutes. Calculate: **07**

(1) Expected queue size(line length)

(2) Probability that the queue size exceeds 10

If the input of trains increases to an average of 33 per day, what will be the change in (1) and (2)?

OR

Q.5 **(a)** The data collected in running a machine, the cost of which is Rs.60, 000, are given bellow. **07**

Years	1	2	3	4	5
Resale value(Rs.)	42000	30000	20400	14400	9650
Cost of Spares(Rs.)	4000	4270	4880	5700	6800
Cost of labour(Rs.)	14000	16000	18000	21000	25000

Determine the optimal period for replacement of the machine.

(b) A manufacturing company processing 6 different jobs on two machines A and B. Number of units of each job and its processing times on A and B are given in the following table. Find the optimum sequence, the total minimum elapsed time and idle time for each machine. **07**

Job Number	No. of Units of Each Job	Processing time(hours)	
		Machine A	Machine B
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14

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