Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER • 2014

Subject code: 172503 **Date: 04/12/2014**

Subject Name: Optimization Methods

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Figures to the right indicate full marks.**
3. **Read questions carefully before answering.**

Q.1 **(a)** Obtain the solution to the following LPP: **07**

Maximize $Z = 0.07X_1 + 0.10X_2$

Subject to $X_1 + X_2 \leq 30000$

$X_1 \geq 6000$

$X_2 \leq 12000$

$X_1 \leq 24000$

$X_1 - X_2 \geq 0$

$X_1, X_2 \geq 0$

(b) A Foundry makes use of three resources to manufacture two different types of castings namely Type A and Type B which fetches a profit of Rs.1600 and Rs.1800 per unit respectively. The foundry has enough Man hours to manufacture 50 units of type A or 20 units of type B castings per day. Type A and Type B casting requires 4 hrs. and 6 hrs. respectively per unit of Machine shop, the availability of which is limited to 144 hrs. Per day. Heat treatment Hrs. available per day is limited but sufficient enough for 30 units of either type of casting. Formulate the above as an LP model. **07**

Q.2 **(a)** Solve the following LPP using simplex method. **07**

Maximize $Z = 2X_1 + 4X_2$

Subject to $2X_1 + X_2 \leq 18$

$3X_1 + 2X_2 \geq 30$

$X_1 + 2X_2 = 26$

$X_1, X_2 \geq 0$

(b) Write the dual problem for the following: **07**

Minimize $Z = 5X_1 - 6X_2 + 4X_3$

Subject to $3X_1 + 4X_2 + 6X_3 \geq 9$

$X_1 + 3X_2 + 2X_3 \geq 5$

$7X_1 - 2X_2 - X_3 \leq 10$

$X_1 - 2X_2 + 4X_3 \geq 4$

$2X_1 + 5X_2 - 3X_3 = 3$

$X_1, X_2, X_3 \geq 0$

OR

(b) If 2 and 4 represents the profit coefficients of the Decision Variables X1 and X_2 respectively in problem Q.2 (a), determine the range for X1 and X_2 in which profits can be varied without change in the Optimum Solution. **07**

Q.3 **(a)** M/s. PQR Machine Tools has three factories namely A, B and C which manufactures milling machines and are then transported to four distribution centers namely W, X, Y & Z. The quantity of half yearly production of each factory, the demand of each distribution centre and the associated transportation cost (in hundred of Rupees) are given as follows: **07**

	W	X	Y	Z	SUPPLY
A	10	8	5	4	7000
B	7	9	15	8	8000
C	6	10	14	8	10000
DEMAND	6000	6000	8000	5000	

(i) Suggest the Optimal transportation Schedule
(ii) Is there any other transportation schedule which is equally attractive? Justify your answer.

(b) A Job shop Production Unit plans to assign 5 jobs to 5 machinists. The effectiveness of the machinist on 50 basis scale for handling different jobs is given in the following table. As an Optimization expert, what should be an optimum assignment? **07**

	M_1	M_2	M_3	M_4	M_5
J_1	40	46	48	36	48
J_2	48	32	36	29	44
J_3	49	35	41	38	45
J_4	30	46	49	44	44
J_5	37	41	48	43	47

OR

Q.3 **(a)** In formulation Q.3 (a) as mentioned above due to business obligation, if M/s PQR Machine Tools has to transport at least 5000 units of milling machines from factory C to distribution centre Y, obtain the optimum transportation cost in such case. **07**

(b) If the elements shown in table of Q.3 (b) represent the cost coefficients of the machinists to perform different jobs on 50 basis scale, determine the optimum assignment. **07**

Q.4 **(a)** One student arrives at every 5 minutes for getting his tutorial checked and there is one faculty who checks the tutorial at a rate of 20 per hour. **07**
(i) What is the probability that there is no student waiting for his turn?
(ii) What is the probability that there are more than 2 students waiting for their turn?
(iii) What is the probability that there is no student waiting?
(iv) What is the probability that a student's tutorial is being checked and no student is waiting?

(b) Reduce the following two person Zero sum game to 2 X 2 order and obtain the optimal strategies for each player and the value of the game: **07**

		COMPETITOR B			
		B_1	B_2	B_3	B_4
COMPETITOR A	A_1	3	2	4	0
	A_2	3	4	2	4
	A_3	4	2	4	0
	A_4	0	4	0	8

OR

Q.4 **(a)** Assume that at a petrol pump, customers arrive in their cars at an average rate of 20 per hour according to Poisson distribution and they are served at an average of one customer for every 2 minutes, the serving time is exponentially distributed. Customers, who arrive from an infinite population, are served on a first come first served basis, and there is no limit to possible queue length. **07**

(i) What is the expected waiting time in the system per customer?
(ii) What is the mean number of customers waiting in the system?
(iii) What is the probability of no customers in the system?
(iv) What is the utilization factor?

(b) Jay and Viru play a game in which each has three coins: a 5 paise, 10 paise and 20 paise. Each one selects a coin without the knowledge of the other's choice. If the sum of the coins is an odd amount, Jay wins Viru's coin and if the sum is even, Viru wins Jay's coin. Determine the optimum strategy for each player and Value of the game. **07**

Q.5 **(a)** A bakery keeps stock of a popular brand of Pizza Base. Previous experience shows the daily demand pattern for the item with associated probabilities, as given: **07**

Daily Demand	0	10	20	30	40	50
Probability	0.01	?	0.15	0.5	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10 days. Also find out the average demand per day.
Random No.s: 25, 39, 65, 76, 12, 05, 73, 89, 19, 49

(b) Solve the following by using TWO PHASE Method: **07**

Maximize $Z= 4X_1 + 5X_2$
Subject to $2X_1 + 3X_2 \leq 6$
$3X_1 + X_2 \geq 3$
$X_1, X_2 \geq 0$

OR

Q.5 **(a)** A Fast Food Restaurant sells a popular brand of Hot Dogs. Previous experience shows the daily demand(Hundred of Units) pattern with associated frequency, as given: **07**

Daily Demand	0	5	10	15	20	25
Frequency	2	11	8	21	5	3

Use the following sequence of random numbers to simulate the demand for next 10 days. Also find out the average demand per day.
Random No.s: 3, 52, 90, 13, 23, 73, 34, 57, 83, 94

(b) Solve the following by using DUAL SIMPLEX Method: **07**

Minimize $Z= 2X_1 + X_2$
Subject to $X_1 + 2X_2 \leq 3$
$3X_1 + X_2 \geq 3$
$4X_1 + 3X_2 \geq 6$
$X_1, X_2 \geq 0$

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