Seat No.: ________ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2018

Subject Code: 2172004/2172011 **Date: 29/11/2018**

Subject Name: Production Optimization Techniques

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)** "Every Linear programming problem exists in pair" Evaluate. **03**

(b) With reference to the graphical method, discuss (i) Feasibility of an Unbounded solution space with an Optimum solution for a maximization problem (ii) Similarity and difference between an unbounded and infeasible solution. **04**

(c) Define the following **07**
1. Redundant constraint 2. Slack Variable 3. Artificial variable

Q.2 **(a)** What do you understand by shadow price? What is the reason of selecting the minimum value of $\mathbf{b_i / a_{ij}}$ as the basis for an outgoing variable? **03**

(b) Solve **04**
Maximize Z = 2x – 3y + z
Subject to
$3x + 6y + z \leq 6$
$4x + 2y + z \leq 4$
$x – y + z \leq 3$
and $x \geq 0, y \geq 0, z \geq 0$

(c) A machine tool company conducts a job-training programme at a ratio of one for every ten trainees. The training programme lasts for one month. From past experience it has been found that out of 10 trainees hired, only seven complete the programme successfully. (The unsuccessful trainees are released). Trained machinists are also needed for machining. **07**
The company's requirement for the next three months is as follows:
January: 100 machinists, February: 150 machinists and March: 200 machinists.
In addition, the company requires 250 trained machinists by April. There are 130 trained machinists available at the beginning of the year.
Pay roll cost per month is:
Each trainee Rs. 400/- per month.
Each trained machinist (machining or teaching): Rs. 700/- per month.
Each trained machinist who is idle: Rs.500/- per month.
(Labor union forbids ousting trained machinists). Build a LPP for producing the minimum cost hiring and training schedule and meet the company's requirement. Do not solve.

OR

(c) Solve : Maximize $Z = 8x_2$ **07**
Subject to : $x_1 - x_2 \geq 0$; $2x_1 + 3x_2 \leq -6$; and x_1 , x_2 unrestricted

Q.3 **(a)** Explain the significance of sensitivity analysis in a LPP. **03**

(b) Solve using two phase method **04**
Min $Z = x_1 – 2x_2 – 3x_3$
Subject to
$– 2x_1 + x_2 + 3x_3 = 2$
$2x_1 + 3x_2 + 4x_3 = 1$
and $x_1 \geq 0, x_2 \geq 0 , x_3 \geq 0$

(c) Explain the following related to simplex table: **07**

(i) Degeneracy & cycling
(ii) Unbounded solution
(iii) Alternate multiple solution

OR

Q.3 **(a)** Compare and Contrast : Assignment and transportation problem **03**

(b) Discuss the techniques for obtaining an optimum solution to a transportation problem. **04**

(c) A company has three factories X, Y, and Z and four warehouses A, B, C, and D. It is required to schedule factory production and shipments from factories to warehouses in such a manner so as to minimize total cost of shipment and production. Unit variable manufacturing costs (UVMC) and factory capacities and warehouse requirements are given below: **07**

From	*UVMC*	*To warehouses*				*Capacity in units per month.*
Factories.	Rs.	Unit shipping costs in Rs.				
		A	B	C	D	
X	10	0	1	1	2	75
Y	11	1	2	3	1	32
Z	12	4	3	3	6	67
Requirement:		65	24	16	15	

Find the optimal production and transportation schedule

Q.4 **(a)** Explain merge and burst event. **03**

(b) Discuss different types of floats in network analysis **04**

(c) Explain the significance of Crashing and Resource allocation with a suitable example. Explain the Johnsons rule of Sequencing with a suitable example. **07**

OR

Q.4 **(a)** Explain the Kendalls notation to a queuing problem **03**

(b) Discuss the types of inventories with suitable example. **04**

(c) A company has 5 jobs to be done. The following matrix shows the return in terms of rupees on assigning i^{th} (i = 1, 2, 3, 4, 5) machine to the j^{th} job (j = A, B, C, D, E). Assign the five jobs to the five machines so as to maximize the total expected profit. **07**

Jobs

Machines		A	B	C	D	E
	1	5	11	10	12	4
	2	2	4	6	3	5
	3	3	12	5	14	6
	4	6	14	4	11	7
	5	7	9	8	12	5

Q.5 **(a)** Explain Dangling and Looping. Why they should be avoided? **03**

(b) Discuss: EOQ, Price-break, Lead-time, Buffer stock. **04**

(c) The following matrix gives the payoff of different strategies (alternatives) A, B, and C against conditions (events) W, X, Y and Z. Identify the decision taken under the following approaches: (i) Pessimistic, (ii) Optimistic, (iii) Equal probability, (iv) Regret, (v) Hurwicz criterion. The decision maker's degree of optimism (α) being 0.7. **07**

Events

	W	*X*	*Y*	*Z*
	Rs.	*Rs.*	*Rs.*	*Rs.*
A	4000	–100	6000	18000
B	20000	5000	400	0
C	20000	15000	– 2000	1000

OR

Q.5 **(a)** Differentiate between Decision node and Chance node. **03**

(b) Explain: Decision making under risk & under uncertainty. **04**

(c) A fleet owner finds form his past records that the cost per year of running a vehicle whose purchase price is Rs. 50000/- are as under: **07**

Year:	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Running cost in Rs.:	5000	6000	7000	9000	21500	18000	18000
Resale value in Rs.:	30000	15000	7500	3750	2000	2000	2000

Thereafter running cost increases by Rs.2000/- per year but resale value remains constant at Rs. 2000/-. At what stage the replacement is due?

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