

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2023

Subject Code:3152008

Date:07-12-2023

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.
4. Simple and non-programmable scientific calculators are allowed.

Q.1 (a) What is the modern approach to management? What are the four major approaches to the study of management? **03**

(b) Differentiate between Transportation and Assignment problem. **04**

(c) Find the minimum value of **07**

$$\begin{aligned} Z &= -x_1 + 2x_2, \\ \text{subject to } & -x_1 + 3x_2 \leq 10, \\ & x_1 + x_2 \leq 6, \\ & x_1 - x_2 \leq 2, \\ & x_1, x_2 \geq 0. \end{aligned}$$

solve the problem by graphical method.

Q.2 (a) Why is it difficult to solve a transportation problem with simplex method? **03**

(b) A Transportation problem cannot be solve using simplex method – Evaluate **04**

(c) What is the logic of introducing an artificial variable in a simplex Table? Describe the two phase process of solving an LPP by simplex method. Why is a Solution containing an artificial variable considered as an infeasible solution? **07**

OR

(c) Solve the following LPP by using simplex method; **07**

$$\text{Max } Z = 6x_1 + 4x_2$$

Subject to

$$x_1 + 2x_2 \leq 720$$

$$2x_1 + x_2 \leq 780$$

$$x_1 \leq 320$$

Q.3 (a) Differentiate between CPM and PERT techniques. **03**

(b) What are different types of inventories? Explain **04**

(c) Find the basics feasible solution of the following transportation problem by the north-west corner rule. Also find the optimal transportation **07**

plan.

	1	2	3	4	5	Available
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Required	60	60	30	40	10	200 Total

OR

- Q.3 (a)** What is an Operations Research model? Discuss the advantages of limitation of good Operations Research model **03**
- (b)** What is degeneracy in a transportation problem ? How is it resolved **04**
- (c)** Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows. Determine the optimum assignment schedule. **07**

		Job				
		1	2	3	4	5
Person	A	8	4	2	6	1
	B	0	9	5	5	4
	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

- Q.4 (a)** List out of the rules in constructing a network diagram? **03**
- (b)** What is (1)Total float (2)Free Float and (3) Independent float **04**
- (c)** Differentiate between the following terms: (1) Logical and Identity Dummy. (2) Earliest starting time (EST) & Latest starting time (LST) (3) Earliest finishing time (EFT) & Latest finishing time (LFT) (4) Merge and Burst event. **07**

OR

- Q.4 (a)** Explain merge and burst event. **03**
- (b)** What is the optimality criterion in the assignment problem? **04**

(c)

Eight jobs 1, 2, ..., 8 are to be processed on a single machine. The processing times, due dates and importance weights of the jobs are represented in table '.

07

Job	Processing time t_i (minutes)	Due date d_i (minutes)	Importance weight w_i	$\frac{t_i}{w_i}$
1	5	15	1	5.0
2	8	10	2	4.0
3	6	15	3	2.0
4	3	25	1	3.0
5	10	20	2	5.0
6	14	40	3	4.7
7	7	45	2	3.5
8	3	50	1	3.0

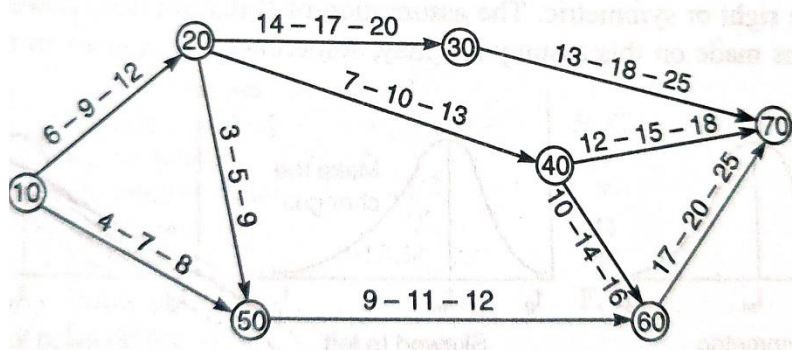
Assuming that no new jobs arrive thereafter, determine using SPT rule and WSPT rule

- optimal sequence,
- completion time of the jobs,
- mean flow time as well as weighted mean flow time,
- average in-process inventory,
- lateness, mean lateness and maximum lateness,
- number of jobs actually late.

Q.5 (a) What is the need for a dummy activity in a network diagram? 03

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

(c) Consider the network shown in fig. For each activity, the three time estimates t_0 , t_m and t_p are given along the arrows in the t_0 - t_m - t_p order. Determine variance and expected time for each activity 07



OR

Q.5 (a) Which are the conditions to be satisfied to solve LPP with simplex method? 03

(b) Define and explain the significance of slack variable and surplus variable 04

(c) What do you mean by network analysis? explain crashing of network and application of network analysis. 07
