

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – SUMMER 2024****Subject Code: 3152008****Date: 18-05-2024****Subject Name: Production Optimization Techniques****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.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- 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**

$$\begin{aligned} Z &= 5x_1 - 2x_2, \\ \text{subject to } 2x_1 + 3x_2 &\geq 1, \\ x_1, x_2 &\geq 0. \end{aligned}$$

solve the problem by graphical method.

- Q.2** (a) State the two basic inventory decisions management must make as they attempt to accomplish the functions of inventory just described by you. **03**
- (b) A Transportation problem cannot be solve using simplex method – Evaluate **04**
- (c) Explain in brief **07**
- (a) Linear programming (b) Assumptions of a linear programming model (c) Application of linear programming

OR

- (c) Use the simplex method to solve following LP problem. **07**
- Max $Z = 6x_1 + 17x_2 + 10x_3$
 Subject to
 $x_1 + x_2 + 4x_3 \leq 2000$
 $2x_1 + x_2 + x_3 \leq 3600$
 $x_1 + 2x_2 + 2x_3 \leq 2400$
 $x_1 \leq 30$ and $x_1, x_2, x_3 \geq 0$

- Q.3** (a) What is an Operations Research model? Discuss the advantages of limitation of good Operations Research model **03**
- (b) Explain the techniques of assigning different work to operators. Discuss the steps involving in Hungarian method **04**
- (c) Solve the following assignment problem using Hungarian Method. **07**
- Cell values represent cost of assigning job A, B, C and D to the machines I, II, III and IV.

		machines			
		I	II	III	IV
jobs	A	10	12	19	11
	B	5	10	7	8
	C	12	14	13	11
	D	8	15	11	9

OR

- Q.3** (a) What are different types of inventories? Explain **03**
- (b) What is unbalanced transportation problem? What should be done to balance the problem? **04**
- (c) Find the basics feasible solution of the following transportation problem by the Vogel's method. Also find the optimal transportation plan. **07**

	D_1	D_2	D_3	D_4	D_5	Available
O_1	68	35	4	74	15	18
O_2	57	88	91	3	8	17
O_3	91	60	75	45	60	19
O_4	52	53	24	7	82	13
O_5	51	18	82	13	7	15
Required	16	18	20	14	14	82 / 82

- Q.4** (a) List out of the rules in constructing a network diagram? **03**
- (b) What is the optimality criterion in the assignment problem? **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 (1)Total float (2)Free Float and (3) Independent float. **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

- (i) optimal sequence,
- (ii) completion time of the jobs,
- (iii) mean flow time as well as weighted mean flow time,
- (iv) average in-process inventory,
- (v) lateness, mean lateness and maximum lateness,
- (vi) number of jobs actually late.

- Q.5 (a) What is the need for a dummy activity in a network diagram? 03
- (b) Discuss: EOQ, Price-break, Lead-time, Buffer stock. 04
- (c) A Project schedule has the following characteristics. 07

Activity	Time (weeks)	Activity	Times (weeks)
1 - 2	4	5 - 6	4
1 - 3	1	5 - 7	8
2 - 4	1	6 - 8	1
3 - 4	1	7 - 8	2
3 - 5	6	8 - 10	5
4 - 9	5	9 - 10	7

- i. Construct the network.
- ii. Compute E and L for each event.
- iii. Find the critical path.

OR

- Q.5 (a) Explain the terms(1)Time estimates (2)Expected time (3)Variance activity 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
