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B.TECH
(SEM V) THEORY EXAMINATION 2021-22
INDUSTRIAL ENGINEERING

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

- 1. Attempt all questions in brief. 2 x 10 = 20**
- a. Write short note on productivity.
 - b. What is group technology?
 - c. Define forecasting.
 - d. What do you mean by scheduling?
 - e. Draw the cost curve for fixed cost, variable cost & total cost.
 - f. What is safety stock? How it is important?
 - g. What are the objectives of standardization?
 - h. What do you understand by ergonomics?
 - i. What are the limitations of graphical method for solving LPP?
 - j. Describe the unbounded solution and no solution conditions with the help of diagram.

SECTION B

- 2. Attempt any three of the following: 10 x 3 = 30**
- a. Describe process & product layout in detail. Also mention benefits & limitations of both.
 - b. What is material requirements planning (MRP)? Discuss its structure in detail. Also describe JIT manufacturing system.
 - c. What is break-even point in business? Show this point on diagram. Explain ABC analysis & VED analysis in inventory control.
 - d. What is method study & what are its objectives? Explain the principle of motion economy in detail.
 - e. Solve the following linear programming problem by Simplex method:
Maximize $Z = 4X_1 + 10X_2$
Subject to constraints: $2X_1 + X_2 \leq 50$
 $2X_1 + 5X_2 \leq 100$
 $2X_1 + 3X_2 \leq 90$
and $X_1 \geq 0, X_2 \geq 0$

SECTION C

- 3. Attempt any one part of the following: 10 x 1 = 10**
- (a) A firm has adopted simple exponential smoothing with $\alpha = 0.1$ to forecast its demand. The forecast for January was 500 units, whereas actual demand was 450 units. Forecast the demand for February. Assume that actual demand during February is 510 units, forecast the demand for the month of March. Continue forecasting up to June, assuming that subsequent demands were actually 520, 490 and 470 respectively. Also differentiate between PERT & CPM.

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- (b) A network is formed by the following activities. The duration of the activities are given below: Draw the network, calculate the project completion time, identify the critical path & draw a table showing total float, free float, and independent float for each activity.

Activity	Preceded by	Duration (Days)
A	Starting	4
B	A	2
C (Terminal)	D	5
D	E	2
E	A	6
F	B	1
G	B	2
H (Terminal)	E,G	3
I (Terminal)	F	2

4. Attempt any *one* part of the following: 10 x 1 = 10

- (a) For the following set of elements draw the precedence diagram, balance the line & determine (i) Balance delay (ii) Line efficiency (iii) Smoothness Index Assume cycle time as one minute.

Element	Station Time T_{si} (minute)	Precedence
1	0.2	-
2	0.4	-
3	0.7	1
4	0.1	1,2
5	0.3	2
6	0.11	3
7	0.32	3
8	0.6	3,4
9	0.27	6,7,8
10	0.38	5,8
11	0.5	9,10
12	0.12	11

- (b) What do you mean by production system? How it is classified? Describe intermittent production system in detail.

5. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain product life cycle in detail. Also discuss about concurrent engineering.
(b) What is value engineering? What are its uses? Describe the steps involved in value analysis.

6. Attempt any *one* part of the following: 10 x 1 = 10

- (a) In a work shop, certain type of machines break-down at an average rate of 6 per hour. The breakdowns are in accordance with Poisson process. The estimated cost of idle machine is 16 rupees per hour. Two repairmen X and Y with different skills are being considered to be hired as repairmen. Repairman X takes six minutes on an average to repair a machine and his wages are 9 rupees



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per hour, whereas the repairman Y takes five minutes to repair and the wages are 10 rupees per hour. Which repairman's service should be used and why? Consider the work shift of 8 hours.

- (b) For a production system annual demand is 8000 unit & ordering cost is 17000 rupees per order & inventory holding cost is 10% of unit price. Items can be purchased in a lot as given below determine the best order size.

Lot Size	Unit Price (In rupees)
1 to 999	200
1000 to 1499	180
1500 to 1999	170
2000 & above	165

7. Attempt any *one* part of the following:

10 x 1 = 10

- (a) Two products A and B are to be machined on three machine tools M1, M2 and M3. Product A takes 10 hrs on machine M1, 6 hrs on machine M2 and 5 hrs on machine M3. The product B takes 7.5 hrs on machine M1, 9 hrs on machine M2 and 13 hrs on machine M3. The machining time available on these machine tools M1, M2, M3 are respectively 75 hrs, 54 hrs and 65 hrs per week. The producer contemplates profit of Rs. 80 per product A, and Rs. 100 per product B. Formulate LP model for maximizing the profit & show the feasible region graphically. Find the optimal solution.
- (b) Use Vogel's approximation method to obtain an initial feasible solution of the transportation problem:

	D1	D2	D3	D4	Available
S1	11	13	17	14	250
S2	16	18	14	10	300
S3	21	24	13	10	400
Demand	200	225	275	250	