**SQ-100**

| Seat No. | |
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# T.Y. B.Tech. (Part-III) (Semester-VI)
# Examination, May-2025
# MECHANICAL
# Industrial Management and Operation Research
# Sub. Code : 81523/66837/81800

**Day and Date : Tuesday, 13/05/2025** **Total Marks : 70**

**Time : 02:30 p.m. to 05:00 p.m.**

**Instructions:** **1) All questions are compulsory.**
**2) Assume suitable data if necessary and state it clearly.**
**3) Figures to the right indicate full marks.**



**Q1) Solve any two.** **[12]**

A) Explain line and Staff organization structure.

B) List and explain the characteristics of good leader.

C) A company wants to hire experienced design engineer for its overseas project. What is potential source of manpower? Describe the steps in recruitment of the same.

**Q2) Solve any two.** **[12]**

A) What is marketing strategy? Explain the importance of 4P's in Marketing mix.

B) What are the principles of material handling?

C) What is the balancing? Explain steps in line balance technique.

**Q3) Solve any two.**

A) Explain positive and negative effect of globalization on small scale industries in India. **[5]**

B) State the measures to prevent accidents due to mechanical factors. **[6]**

C) An engineering graduate wants to start an Industrial Fabrication shop. **[6]**
How he should establish the feasibility for the project.

**Q4) Solve any two.** **[12]**

A) Use Graphical method to solve the following :

Maximize $Z = 40\ x_1 + 100 x_2$

Subject to the conditions $12x_1 + 6x_2 \leq 3000$

$4x_1 + 10x_2 \leq 2000$

$2x_1 + 3x_2 \leq 900$ and $x_1, x_2, \geq 0$

B) A firm uses lathe, milling and grinding machine to produce two machine parts. The table represents the machining time required, machining time available and profit on each machine.

| Type of Machine | Machining time required (min) | | Maximum time available per week |
|---|---|---|---|
| | I | II | |
| Lathe | 12 | 6 | 3000 |
| Milling | 4 | 10 | 2000 |
| Grinding | 2 | 3 | 900 |
| Profit per Unit | Rs. 40 | Rs. 100 | |

C) A plant manufactures two products A and B. The profit contribution of each product has been estimated as Rs. 30 for product A and Rs. 24 for B. Each product passes through three departments of the plant. The time required for each product and total time available in each department are as follows :

| Department | Product | | Available hrs during the month |
|---|---|---|---|
| | A | B | |
| 1 | 3 | 2 | 1800 |
| 2 | 2 | 4 | 1500 |
| 3 | 1 | 1 | 700 |

The company has a contract to supply at least 250 units of product A per month. Formulate the problem as a LPP model to maximize the profit.

**Q5) Solve any two.** **[12]**

A) Find and IBFS to the following problem by North-west corner Rule.

| | Transportation Cost in Rs/per unit | | | | |
|---|---|---|---|---|---|
| **From** | **To** | | | | |
| | **1** | **2** | **3** | **4** | **Supply** |
| **A** | 2 | 3 | 11 | 7 | **6** |
| **B** | 1 | 0 | 6 | 1 | **1** |
| **C** | 5 | 8 | 15 | 9 | 10 |
| **Demand** | **7** | **5** | **3** | **2** | |

B) Find and IBFS to the following problem by VAM.

| **From** | **To** | | | | |
|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **Supply** |
| **A** | 4 | 6 | 8 | 13 | **50** |
| **B** | 13 | 11 | 10 | 8 | **70** |
| **C** | 14 | 4 | 10 | 13 | **30** |
| **D** | 9 | 11 | 13 | 8 | **50** |
| **Demand** | **25** | **35** | **105** | **20** | |

C) Four different jobs are to be done on four different machines.
The table indicates the cost of producing job i on machine j in ruppes.

| | **Machine** | | | |
|---|---|---|---|---|
| **Jobs** | **A** | **B** | **C** | **D** |
| **1** | 5 | 7 | 11 | 16 |
| **2** | 8 | 5 | 9 | 6 |
| **3** | 4 | 7 | 10 | 7 |
| **4** | 10 | 4 | 8 | 3 |

Assign jobs to different machines so that the total cost is minimized.

**Q6) Solve any two.**

A) Determine optimal sequence, elapsed time and idle time (in hrs) of the following five jobs on the machine A and B used in the same sequence to process these jobs. **[5]**

| Job/m-c | J1 | J2 | J3 | J4 | J5 |
|---|---|---|---|---|---|
| Machine A | 5 | 1 | 9 | 3 | 10 |
| Machine B | 2 | 6 | 7 | 8 | 4 |

B) Draw the Project Network for following activities and determine critical path and project duration. **[6]**

| Activity | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Preceding activity | - | - | - | A | B | B | C | D | E | H,I | F,G |
| Duration (days) | 16 | 18 | 14 | 30 | 8 | 2 | 8 | 10 | 8 | 5 | 4 |

C) Draw the Project Network for following activities. **[6]**

| Activity | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Precding activity | - | - | B | A | C | C | F | F | H | I | D,E, G.J | I | K, L |