

III B. Tech II Semester Regular Examinations, April - 2016
INDUSTRIAL ENGINEERING MANAGEMENT

(Mechanical Engineering)

Time: 3 hours

Maximum Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answering the question in **Part-A** is compulsory
 3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) Define Industrial Engineering. [3M]
- b) What are the objectives of plant maintenance? [3M]
- c) Explain the term PMTS. [4M]
- d) State the importance of Quality control. [4M]
- e) What is profit sharing? [4M]
- f) State Fulkerson's rule for numbering the nodes in a network. [4M]

PART -B

- 2 a) Differentiate between production and productivity. [4M]
- b) Explain the contributions of Taylor for scientific management and how it leads to the concept of scientific management. [8M]
- c) State the functions of the management in an organisation. [4M]
- 3 a) What do you mean by optimal design in plant layout? [4M]
- b) Briefly discuss the factors to be considered for the selection of a location for a factory construction. [8M]
- c) Explain the importance of preventive maintenance in production management. [4M]
- 4 a) State the differences between method study and work measurement with their objectives. [8M]
- b) Explain the need and procedure for conducting work sampling study. [8M]
- 5 a) The following table gives the coded measurement obtained from 20 subgroups of 5 each: [8M]

| Subgroups No. | Statistics | Subgroups No. | Statistics |
|---------------|--------------|---------------|------------|
| 1 | -1,2,1,0,1 | 11 | 0,1,-3,2,1 |
| 2 | 2,0,1,0,1 | 12 | 2,1,-1,0,0 |
| 3 | 1,1,0,0,1 | 13 | 0,1,-3,2,1 |
| 4 | 2,1,0,-1,0 | 14 | 0,0,-1,0,1 |
| 5 | 1,-1,0,0,-1 | 15 | -1,2,1,1,2 |
| 6 | 1,-1,2,0,2 | 16 | 1,-1,2,0,2 |
| 7 | -1,-1,0,-2,1 | 17 | 2,1,-1,0,0 |
| 8 | 1,1,2,-1,0 | 18 | 2,0,1,0,1 |
| 9 | 2,1,-1,0,0 | 19 | 0,1,1,-1,1 |
| 10 | -2,1,-2,2,1 | 20 | 3,-3,1,1,1 |

- i. Construct the \bar{X} and R charts and plot the points on the chart
- ii. What will be the control limits on \bar{X} and R charts for immediate future?
- iii. Estimate the value of σ .

- b) Explain in detail about the need of ISO quality systems in an industry. [8M]
- 6 a) Why an employee must be rated? State and explain different methods of employee rating. [8M]
 b) Discuss the fundamental requirements of good financial wage incentive system. [8M]
- 7 a) What is the need for value analysis of a product? [4M]
 b) State the difference between PERT and CPM in project management. [4M]
 c) A project has the following time schedule: [8M]

| Activity | Time in weeks | Activity | Time in weeks |
|----------|---------------|----------|---------------|
| 1 – 2 | 2 | 4 – 6 | 3 |
| 1 – 3 | 2 | 5 – 8 | 1 |
| 1 – 4 | 1 | 6 – 9 | 5 |
| 2 – 5 | 4 | 7 – 8 | 4 |
| 3 – 6 | 8 | 8 – 9 | 3 |
| 3 – 7 | 5 | | |

Construct PERT network and compute

- i. T_L and T_E for each event
- ii. Float for each activity
- iii. Critical path and its duration

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PART -A

- 1 a) Define scientific management. [3M]
- b) Define plant maintenance schedule. Write down the procedure for scheduling plant maintenance. [5M]
- c) Explain the importance of Ergonomics. [4M]
- d) Explain the term TQM. [3M]
- e) What is incentive? How it helps to improve production? [4M]
- f) State the modules of ERP. [3M]

PART -B

- 2 a) State the role of an Industrial Engineer in shop floor. [4M]
- b) Explain the tools that are used in Industrial engineering for solving managerial problems. [8M]
- c) Describe the importance of management in an Organization. [4M]
- 3 a) State the principle of plant layout. [3M]
- b) Explain various types of plant layouts with their relative advantages over other types. [8M]
- c) Explain the different types of maintenance system followed in a continuous process Industry. [5M]
- 4 a) Explain the steps followed in method study of job process. [8M]
- b) What is process Chart? Explain different types of process chart with relevant sketches. [8M]
- 5 a) Construct (\bar{X}) and R-charts for the following information and state whether the process is in control. For each of the following, (\bar{X}) has been computed from a sample of 5 units drawn at an interval of 1 hour from an ongoing manufacturing process. [8M]

| S. No. | X ₁ (10 am) | X ₂ (11 am) | X ₃ (12 noon) | X ₄ (1 pm) | X ₅ (2 pm) |
|--------|---------------------------|---------------------------|-----------------------------|--------------------------|--------------------------|
| 1 | 10.02 | 10.15 | 9.85 | 10.02 | 9.97 |
| 2 | 9.97 | 9.98 | 9.96 | 9.92 | 10.05 |
| 3 | 10.08 | 10.02 | 10.1 | 10 | 10.01 |
| 4 | 9.92 | 10.12 | 10.08 | 10.02 | 10.05 |
| 5 | 10.02 | 10.06 | 10.04 | 9.95 | 9.89 |

- b) Explain six sigma concept. How do you think that this concept would improve the productivity? [8M]
- 6 a) What are the objectives and functions of trade union? [8M]
b) Explain Rowan plan of wage rating. [8M]
- 7 a) Explain the rules of network construction. [8M]
b) In the following table optimistic, most likely and pessimistic times are respectively shown against each connected activity from 1 to 10 in a project. [8M]

| Activity | Time | Activity | Time |
|----------|------------|----------|-------------|
| 1 - 2 | 4 , 8 , 12 | 2 - 3 | 1 , 4 , 7 |
| 2 - 4 | 8 , 12, 16 | 3 - 5 | 3 , 5 , 7 |
| 4 - 5 | 0 , 0 , 0 | 4 - 6 | 3 , 6 , 9 |
| 5 - 7 | 3 , 6 , 9 | 5 - 8 | 4 , 8 , 6 |
| 6 - 10 | 4 , 6 , 8 | 7 - 9 | 4 , 8 , 12 |
| 8 - 9 | 2 , 5 , 8 | 9 - 10 | 4 , 10 , 16 |

- i. Construct a network.
- ii. Find the critical path and its duration
- iii. The schedule completion time for the project is 48 days. Calculate the probability of finishing the project within the time.

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PART -A

- 1 a) What do you understand from the term production management? [3M]
- b) Differentiate between preventive and breakdown maintenance. [4M]
- c) Explain MTM. [4M]
- d) Define zero defect concept. [4M]
- e) State few non-financial incentives offered to the employees in a manufacturing industry. [4M]
- f) What is critical path in the network diagram? [3M]

PART -B

- 2 a) Explain the scope and application of Industrial Engineering. [4M]
- b) Explain Henri Fayol's principles of management thoughts. [6M]
- c) State the relationship between Management, Administration and Organization. [6M]
- 3 a) How Preventive maintenance is evaluated? [2M]
- b) State the advantages and disadvantages of selecting the plant location in an urban and a rural site. [8M]
- c) Explain the Quantitative techniques for optimal design of layouts. [6M]
- 4 a) What is time study? Describe the steps involved in time study. [8M]
- b) Explain how a high productive design of a work place layout can be made with the concept of Ergonomics motion economy [8M]
- 5 a) Construct control chart \bar{X} - R for the following data on the basis of 12 samples collected from a process, 5 data points are taken every hour. Comment on the state of control, assuming that these are the first data. What will be future control limit? [8M]

| | | | | | | | | | | | |
|----|----|----|----|----|-----|-----|----|----|-----|-----|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | | | | | | | | | | | |
| 42 | 42 | 19 | 36 | 42 | 51 | 60 | 18 | 15 | 69 | 64 | 61 |
| 65 | 45 | 24 | 54 | 51 | 74 | 60 | 20 | 30 | 109 | 90 | 78 |
| 75 | 68 | 80 | 69 | 57 | 75 | 72 | 27 | 39 | 113 | 93 | 94 |
| 78 | 72 | 81 | 77 | 59 | 78 | 95 | 42 | 62 | 118 | 109 | 109 |
| 87 | 90 | 81 | 84 | 78 | 132 | 138 | 60 | 84 | 153 | 112 | 136 |

- b) What is Quality circle? How the implementation of Quality circle enhance the Production? [8M]

- 6 a) Explain the functions of personnel management. [8M]
 b) State the need and types of Job-evaluation. [8M]
- 7 a) Explain the concept of supply chain management and the parameters that influence the supply chain design. [8M]
 b) The table given below shows the activity details for a construction project, with the time estimates of each activity in days. [8M]

| Activity | Time estimate | | |
|----------|---------------|-------------|-------------|
| | Optimistic | Most likely | Pessimistic |
| 1 – 2 | 2 | 5 | 8 |
| 2 – 3 | 8 | 11 | 20 |
| 3 – 4 | 0 | 0 | 0 |
| 2 – 4 | 4 | 7 | 16 |
| 2 – 5 | 4 | 9 | 20 |
| 4 – 6 | 7 | 10 | 13 |
| 5 – 6 | 3 | 7 | 17 |
| 3 – 7 | 3 | 5 | 13 |
| 6 – 7 | 2 | 3 | 10 |
| 7 – 8 | 2 | 4 | 6 |

- i. Construct the network
- ii. Find the critical path and the project duration
- iii. Determine the probability of completion of project in 40 days.



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PART -A

- 1 a) How Industrial Engineering plays an important role in an industry? [3M]
- b) List the major factors that govern the plant location for an automotive and auto component manufacturing industry. [4M]
- c) What is Therbligs? [4M]
- d) Define SQC. [3M]
- e) State the difference between merit rating and job evaluation. [4M]
- f) What is the significance of crashing in network technique? [4M]

PART -B

- 2 a) Define Productivity. What are the different kinds of productivity measures? [6M]
- b) Explain briefly about Douglas McGregor theory X and theory Y on motivation and management with the assumptions. [6M]
- c) Differentiate between production management and Industrial engineering. [4M]
- 3 a) To increase the productivity, what type of maintenance must be carried out in the shop floor? State its importance. [4M]
- b) Discuss Product type of layout. State the advantage and disadvantage of product type of layout over process type of layout. [8M]
- c) Explain the steps involved in designing a plant layout [4M]
- 4 a) Explain how micro-motion study is performed. [8M]
- b) Describe briefly the different technique of rating used in connection with work study of an operator's performance in a labor intensive industry. [8M]
- 5 a) The following data (two subgroup of size 4), is from two different machines which are supposed to be alike. Plot the necessary chart to show whether their product would support this assumption. If they don't, does this prove the machines are not essentially alike? [8M]

| Machine 1 | | | Machine 2 | | |
|-----------|---------|-------|-----------|---------|-------|
| Subgroup | Average | Range | Subgroup | Average | Range |
| 1 | 2.77 | 0.06 | 1 | 2.53 | 0.12 |
| 2 | 2.70 | 0.29 | 2 | 2.67 | 0.30 |
| 3 | 2.78 | 0.19 | 3 | 2.66 | 0.17 |
| 4 | 2.67 | 0.12 | 4 | 2.57 | 0.25 |
| 5 | 2.75 | 0.34 | 5 | 2.60 | 0.24 |
| 6 | 2.77 | 0.23 | 6 | 2.60 | 0.05 |
| 7 | 2.75 | 0.17 | 7 | 2.70 | 0.30 |
| 8 | 2.73 | 0.06 | 8 | 2.56 | 0.04 |
| 9 | 2.76 | 0.23 | 9 | 2.70 | 0.19 |
| 10 | 2.63 | 0.20 | 10 | 2.67 | 0.08 |
| 11 | 2.73 | 0.17 | 11 | 2.60 | 0.11 |
| 12 | 2.74 | 0.28 | 12 | 2.63 | 0.14 |
| 13 | 2.73 | 0.26 | 13 | 2.71 | 0.24 |
| 14 | 2.72 | 0.13 | 14 | 2.63 | 0.31 |
| 15 | 2.73 | 0.13 | 15 | 2.75 | 0.17 |

- b) Describe the key steps involved in the process of getting registered to ISO 9000 certification. [8M]
- 6 a) Why is it important to manage human resource in an organization? Discuss. [8M]
 b) Explain any one type of wage incentive plan that you think will improve the productivity of a continuous production industry. [8M]
- 7 a) What is enterprise resource planning? [3M]
 b) In what ways an organization is benefited by the implementation of ERP. [5M]
 c) The following data gives the information about duration and cost of various activities in a project network [8M]

| Activity | Normal duration (weeks) | Normal cost (in Rs.) | Crash duration (weeks) | Crash cost (in Rs.) |
|----------|-------------------------|----------------------|------------------------|---------------------|
| 1 – 2 | 4 | 4000 | 2 | 12000 |
| 2 – 3 | 5 | 3000 | 2 | 7500 |
| 2 – 4 | 7 | 3600 | 5 | 6000 |
| 3 – 4 | 4 | 5000 | 2 | 10000 |

The project overhead costs are Rs.2000 per week. Find the optimum duration and cost associated with it. Also, draw the least cost network.

