

- N.B.** 1. Attempt any five questions including Q1 which is compulsory.
 2. Assume suitable data if required.
 3. Figures to the right indicate full marks.

Q.1 Attempt any four of the following:—

- A) Techniques of industrial engineering
 B) MRP I
 C) Performance rating
 D) Difference between value engineering & value analysis
 E) Cost of quality
 F) Evolution of ERP.



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Q.2 A) what is industrial engineering? Also write its objectives. 10

B) Write steps in value engineering. 10

Q.3 A) Explain method study and its objectives. Also explain criteria for selection job, process; and department for method analysis. 10

B) The observed time and the performance rating for five elements are given; calculate the standard time assuming rest and personal allowance as 15% and contingency allowance as 3% of basic time.

| Element | Observed time (min) | Rating |
|---------|---------------------|--------|
| 1 | 0.30 | 85% |
| 2 | 0.80 | 95% |
| 3 | 1.40 | 90% |
| 5 | 0.18 | 85% |

Q.4 A) During manufacturing of a part a certain quality characteristic is measured and \bar{X} & R values computed. Following are the details.

$$\sum \bar{X} = 360.40 \text{ and } \sum R = 8.82$$

Subgroup size is 5 and there are 25 subgroups.

If the specification limits are 14.42 ± 0.42 & If the process is in control calculate i) Process capability ii) Control limits for \bar{X} & R chart iii) Comment on the process.

Given: For subgroup size of 5 items $A_2=0.58$, $d_2=2.326$, $D_3=0$, $D_4=2.115$. 10

B) Explain the following:

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- i) Quality of design
- ii) Quality of conformance to design
- iii) AQL
- iv) AOQ \textcircled{Y} LTPD.

Q.5 A) The model J wagon is to be assembled on a conveyor belt. Five hundred 10 wagon are required per day. Production time/day is 420minutes, and assembly steps for the wagon are given in table. Find the balance that minimizes the number of workstations, subject to cycle time & precedence constraints.

| Task | Task time in seconds | Description | Task that must precede |
|------|----------------------|---|------------------------|
| A | 45 | Position rare axle support | --- |
| B | 11 | Insert rare axle | A |
| C | 9 | Tighten rear axle support | B |
| D | 50 | Position front assembly | --- |
| E | 15 | Tighten front axle assembly screw | D |
| F | 12 | Position rear wheel 1 & fasten hand caps | C |
| G | 12 | Position rear wheel 2 & fasten hand caps | C |
| H | 12 | Position front wheel 1 & fasten hand caps | E |
| I | 12 | Position rear wheel 2 & fasten hand caps | E |
| J | 8 | Position wagon handle shaft on front axle | F, G, H, I |
| K | 9 | Tighten bolt & nut | J |

B) What is plant layout? Discuss different types of layout.

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Q.6 A) Discuss various elements of ERP architecture. How will you justify the ERP system in terms of cost, tangible and intangible benefits.

B) What are the stages of ERP implementation? What are possible hurdles in implementing it?

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Q.7 Discuss the following.

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- A) JIT
- B) Therbligs
- C) BPR & ERP
- D) Ergonomics & its objectives.