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B.Tech. (M) / III

J

Paper EME–306 – INDUSTRIAL ENGINEERING

Time : 3 hours

Maximum Marks : 70

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

*Answer any five questions.
All questions carry equal marks.*

Assume missing data, if any.

1. (a) What are different factors that influence plant location? Discuss with a case illustration of steel plant. 7

   (b) Explain the advantages, limitations and suitability of following layouts:

   (i) Product layout

   (ii) Cellular layout. 7

2. (a) Discuss different scheduling rules. By applying these rules, compare the values of total flow time, mean flow time, total lateness of Job and average lateness of Job for the following problem of five jobs to be processed on one machine:

Job (in Sequence of Arrival)	Processing Time (Days)	Due Date (Days from now)
J_1	4	6
J_2	5	7
J_3	3	8
J_4	7	10
J_5	2	3

   7

   (b) Consider seven jobs that are processed on two operations: X and Y. The Job is processed in sequence so that Y should follow X. Determine the optimal order in which the jobs should be sequenced. Also draw the Gantt chart and calculate the idle time for both the operations.

P. T. O.

Job	1	2	3	4	5	6	7
Processing Time on X	4	2	1	6	7	8	9
Processing Time on Y	7	6	2	3	7	5	6

7

3. (a) Explain different costs involved in inventory models. Derive the expression for economic order quantity when the demand of item is uniform, the production rate is infinite and no stock-outs are allowed. Explain the assumptions. 7

   (b) Using simple EOQ formula, show that the EOQ model is quite robust near the optimal point.

   The ordering cost of an item in Rs. 50 per order, holding cost is 10% of the purchase price, which is Rs. 110 per unit. Calculate the economic order quantity for an annual demand of 50,000 units.

   Also calculate the time between two consecutive orders, number of orders per year and total optimal cost. 7

4. (a) Discuss different types of sampling plans. How do acceptance sampling plans differ from process control charts? 7

   (b) What is an operating characteristic curve? Define following terms:

   (i) AQL

   (ii) LTPD

   (iii) Producer risk

   (iv) Consumer risk. 7

5. (a) What is Work Study? Describe the different types of charts used in Motion Study and explain their uses. 7

   (b) Define performance rating. In a time study for a job done by worker whose rating is 80, the data are as follows:

   Observed time=20 minutes

   Personal needs allowance = 40% of Basic time

   Fatigue allowance=2·5% of Basic time

   Contingency work allowance=2% of Basic time.

   Contingency delay allowance=1% of Basic time

   Find:

(i)   Basic time

(ii) Work content

(iii) Standard time.   7

6. (a) What do you understand by production planning and control? Discuss its main elements or functions.   6

   (b) Consider the precedence diagram of 13 work elements as shown in figure 1. The time for each work element is at the top of each node.
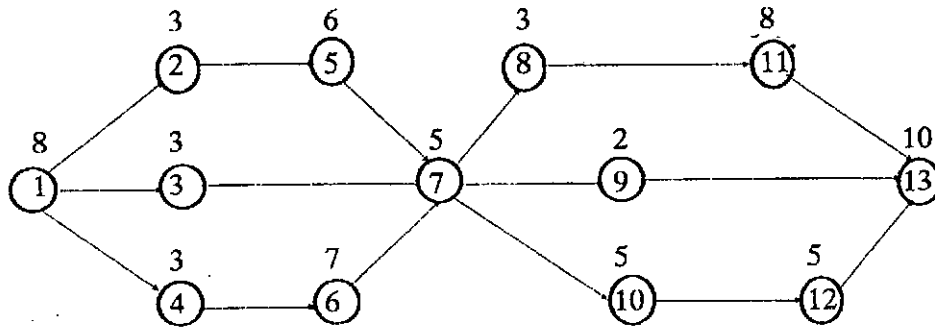

Fig. 1

Calculate:

(i)   Ideal number of work stations

(ii) Cycle time

(iii) Balance delay.   8

7. (a) In a factory producing spark plugs the number of defectives found in inspection of 20 lots of 100 each is given below:

Lot No.	No. of Defectives	Lot No.	No. of Defectives
1.	5	11.	4
2.	10	12.	7
3.	12	13.	8
4.	8	14.	3
5.	6	15.	3
6.	4	16.	4
7.	6	17.	5
8.	3	18.	8
9.	3	19.	6
10.	5	20.	10

(i) Construct $\bar{p}$ chart and state' whether the process is in statistical control or not.

(ii) Determine sample size when a quality limit not worse than 9% is desirable and a 10% bad product will not be permitted more than three times in thousand.   8

(b) Compare variable charts with attribute charts for process control.   6

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