Ref. No.: Ex/PROD/PC/B/T/311/2024(S)

B.E. PRODUCTION ENGINEERING THIRD YEAR FIRST SEMESTER SUPPLEMENTARY EXAMINATION – 2024

Subject: PRODUCTION MANAGEMENT

Time: Three Hours **Full Marks: 100**

Answer Question No. 1 and any three from the rest

1. Answer any five questions from the following:
   a) Define quantity control, quality control and productivity control of a production, system. Explain management approach to three control systems of production functions. (8)
   b) What is scheduling? Describe different types of Production Control System. (8)
   c) What is the role of Gantt Chart? Explain with suitable diagrams. (4+4)
   d) What are the MRP basics? What are data sources for determining the MPS? (4+4)
   e) Explain the Push & Pull type of Production Controls. Mention the aims of JIT and Lean Manufacturing. (5+3)
   f) Explain the role of MRP in manufacturing planning and control system with suitable diagram. (8)
   g) Explain All-Units and Incremental order discount cost functions with suitable diagrams. (8)

2. (a) Explain the characteristics of forecast.
   (b) The sales of a product during the last four years were 860, 880, 870 and 890 units. The forecast for the fourth year was 876 units. If the forecast for the fifth year, using simple exponential smoothing, is equal to the forecast using a three-period moving average, what would be the value of the exponential smoothing constant (α)?

   (c) Two forecasting methods have been used to evaluate the same economic time series.

Forecasting Method 1	Forecasting Method 2	Realized Value of the Series
223	210	256
289	320	340
430	390	375
134	112	110
190	150	225
550	490	525

   Compare the effectiveness of these methods by computing the MSE, the MAD, and the MAPE. Do each of the measures of forecasting accuracy indicate that the same forecasting technique is best? If not, why?

   (5 + 5 + 10)

3. (a) ABC corporation currently practices the following system for the procurement of an item. No. of orders placed in a year = 8, ordering cost = 750 / order, each time order quantity = 250, carrying cost = 40%, comment on the ordering policy of the company and estimate the loss to the company in not practising scientific inventory policy.

   (b) The Toppex Chemical Company produces a chemical compound that is used as a lawn fertilizer. The compound can be produced at a rate of 10,000 Kgs per day. Annual demand for the compound is 0.6 million Kgs per year. The fixed cost of setting up for a production run of the chemical is Rs. 15,000, and the variable cost of production is Rs. 35 per Kg. The company uses an interest rate of 22 percent to account for the cost of capital, and the costs of storage and handling of the chemical amount to 12 percent of the value.

Assume that there are 250 working days in a year.

(i) What is the optimal size of the production run for this particular compound?

(ii) What proportion of each production cycle consists of uptime and what proportion consists of downtime?

(iii) What is the average annual cost of holding and setup attributed to this item? If the compound sells for Rs. 39 per pound, what is the annual profit the company is realizing from this item?

(5+15)

4. (a) A scheduler has four jobs that can be performed in any one of four centers. Time requirements for processing the jobs in those machine centers are listed in the table below. Determine the optimum allocation of jobs to the machine centers.

Job	**MC1**	**MC2**	**MC3**	**MC4**
A	8	15	9	10
B	5	12	18	20
C	7	9	12	15
D	14	4	16	6

(b) Auto painters and Tinkers (APT) are planning for short term on a daily basis. They have four lines for tinkering and painting jobs through lines 1, 2, 3 and 4. Today, they have seven jobs A, B, C, D, E, F and G to be allocated to the lines. The following table gives the estimates of job-times in hours. While line 1 and 2 have a capacity of 12 hours each, the line 3 and 4 work longer, 18 hours each. The jobs are classified in order of priority as: A, B, C, D, E, F, and G. How would you allocate the jobs to different lines?

Job	Line			
	1	2	3	4
A	7	14	11	18
B	19	9	14	10
C	15	25	20	10
D	6	9	7	14
E	4	8	9	5
F	10	12	11	15
G	8	5	4	7

(10 + 10)

5. (a) What is line balancing? Explain the terms: Cycle time; Work station & Balance Delay.

(b) The work involved in assembling a small component can be described in terms of 10 minimum rational work elements whose elemental times and precedence relationship are given below:

Work Elements	1	2	3	4	5	6	7	8	9	10
Immediate Pre.	-	-	2	1,3	4	4	5,6	5,6	7,8	9
Tune (in min.)	4	4	3	2	2	3	5	7	9	2

(i) Based on the heuristic method, assign work elements to work station in order to minimize the number of work stations on line. (ii) Calculate the balancing loss of the proposed assembly line. (5 + 15)

6. (a) How has the modern ERP system been evolved?

(b) Consider the product structure shown in Fig. 1. Lead times for each item are: X: 5 weeks. Y: 3 weeks, Z:2 weeks, A: 1 weeks, B: 2 weeks, C: 3 weeks. The MPS for the End item (X) for weeks 11 through 18 is given below.

Week	11	12	13	14	15	16	17	18
Net Requirements	100	100	40	40	100	200	200	200

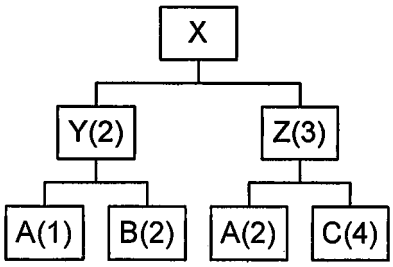

Fig. 1

Assume that lot-for-lot scheduling is used throughout. Also assume that there is no entering inventory in period 11 and there is a schedule receipt of 30 no. of component Z at the beginning of week 13. Determine the planned order release for component A, C and Z.

(5 + 15)