

Ex/ME (M2)/H/B/T/322/2022

**BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING EXAMINATION, 2022**  
(3rd Year, 2nd Semester )  
**INDUSTRIAL MANAGEMENT**

Time : Three hours

Full Marks : 100

Answer any Five for the full marks

1. (a) "Frederick Winslow Taylor is regarded as the father of today's management era"- discuss, highlighting the contribution of Taylor.  
(b) What type of organizational structure is suitable for a manufacturing industry? Discuss with an explanatory structure in this regard.  
(c) Stating the assumptions and defining the legends to be used, develop an inventory model for, 1) deterministic batch size **OR**, 2) Economic Production Quantity.

6 + 6 + 8 = 20

2. (a) M/s Indian Manufacturers Ltd. (IML) wants to liquidate its stock of Tiny Toys of 200 of metal chair and 100 of Tiny Toys of metal tables. They have decided to put together two offers, A and B. Offer A is a package of one chair and one table which will sell for USD 30. Offer B is a package of three chair and one table, which will sell for USD 50. IML does not want to sell less than 20 packages of offer A and less than 10 of offer B. How many packages of each do they have to sell to maximize the revenue generated from the promotion? Use graphical method.  
(b) Identify and discuss the critical activities in a Purchase Function with the help of a flow diagram focusing their impact on business.  
(c) Develop an analytical framework using a standard QC tool to identify root causes of the problem – *Blow holes in cast product.*

7 + 7 + 6 = 20

3. (a) In forecasting, how common smoothing method is applied. Use a 3-period weighted moving average method referring to the data in the table below to forecast the sales for the week 11 giving a weight of 0.5 to the most recent period, 0.4 to the second most recent period and 0.1 to the third most recent period.

Week	Sales	Week	Sales
1	145	6	120
2	140	7	135
3	155	8	165
4	130	9	130
5	135	10	140

- (b) Critically discuss the impact of ES, EF, LS, LF and Slack in a project Network.
- (c) What are the impacts of MRP on business? Schedule the required materials for a project where a long shaft is to be mounted with three number of bearings. The master schedule is prepared for 8 weeks while the gross requirements of shaft-bearing assembly are 1000 in 5<sup>th</sup> week and 1000 in 8<sup>th</sup> Week. The delivery of 200 shafts is scheduled in 2<sup>nd</sup> and 4<sup>th</sup> week each while the delivery of bearings is scheduled for 2000 in 2<sup>nd</sup> week and 1500 in 6<sup>th</sup> week. There are 800 shafts and 800 bearings are available in inventory in the 1<sup>st</sup> week. Based on these data prepare the Material Requirement Plan (MRP) for Shafts and Bearings in tabular form.

2 + 5 + 4 + 2 + 7 = 20

[ Turn over

4. (a) Classify the systems adopted in manufacturing. In case of a sustained demands in market which system do you prefer to adopt and what are the advantages of adopting the same over other system.  
 (b) Discuss seven principles on which the Plant layout should be planned.  
 (c) Starting from the definition of Circular Economy, explain how the resource efficiency can be improved by implementing Circular Economy.

2+ 6 + 4 + 6 = 20

5. (a) Drawing an explanatory diagram discuss about different stages of a bath tub curve. What is the significance of this curve in connection with 'terotechnology'? Discuss.  
 (b) Mention the fixed cost items and variable cost items in break-even analysis.  
 c) Fixed factory overhead and fixed selling overhead costs of a small factory are Rs.60,000/- and Rs.12000/- respectively. Variable manufacturing cost is Rs.12/- per unit whereas, variable selling cost per unit is Rs.3/- only. An unit is sold in the market at a price of 24/-. Find out:  
 (i) Break-even point in terms of sales value and number of units,  
 (ii) Contribution  
 (iii) Number of units that must be sold to make a profit of Rs.90,000/-.

- (c) Drawing the network diagram for the following project activities find out the critical path and the project duration. Tabulate the values systematically mentioning the formulae used.

Activity	Description	Immediate Predecessor	Duration (Hrs.)
A	Receipt of raw materials	-	0.5
B	Bolt cutting	A	1.0
C	Drilling and cutting operations	B	1.5
D	Transfer machine	B	1.4
E	Barrel pinning	D	1.2
F	Shackle groove cutting	B	0.8
G	Shackle bending	F	1.0
H	Shackle is inserted into the body	C, E, G	0.4
I	Barrel is inserted into the body	H	1.4
J	Packaging of padlock	I	0.5

5 + (2 + 5) + 8 = 20

6. (a) "The main clauses of ISO 9001:2015 QMS standard can help to enhance the quality of the organization leading to Zero Defects" – Critically analyse and justify the statement.  
 (b) Develop the format of the document, based on which the inspection is carried out in manufacturing/service sectors.  
 (c) Make Critical analysis of the terms and their importance in manufacturing units: Inspection, Quality Control and Quality Assurance with example.

10 + 4 + 6 = 20

7. (a) A component part for a jet aircraft engine is manufactured by an investment casting process. The vane opening on this casting is an important functional parameter of the part. Six sets of data, collected at random, are furnished below:

Sample No.	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>
1	33	29	31	32	33
2	33	31	35	37	31
3	35	37	33	34	36

4	30	31	33	34	33
5	33	34	35	33	34
6	38	37	39	40	38

Illustrate, using graph paper, the use of Average and Range control charts to assess the statistical stability of this process. Control limit factors are given in the following table:

Subgroup Size	A2	D3	D4
2	1.88	0	3.27
3	1.02	0	2.57
4	.73	0	2.28
5	.58	0	2.11
6	.48	0	2.00
7	.42	.08	1.92
8	.37	.14	1.86
9	.34	.18	1.82
10	.31	.22	1.78

(b) Define 'Reliability, 'Maintainability and 'Availability' (RAM) concepts.

A system has a mean time between failures of 100 hours and a mean time required to repair is 10 hours. What is the inherent availability? If the mean time between the corrective maintenance is 900 hours, then what will be the operational availability for the system for a mean down time of 10 hours?

$$10 + (6 + 4) = 20$$

8. Write brief notes on:

[any two from group (A) and any two from group (B)]

**(A)**

- (i) Utilization factor in queuing/waiting line models
- (ii) Modified Johnson's algorithm
- (iii) Forecast for a period,  $Y = f(\text{TCSR})$
- (iv) Design the Format of Requisition slip in purchase function
- (v) Dependent and independent demand in purchase management.

**[B]**

- (vi) Total Quality Management
- (vii) EWMA technique of industrial forecasting
- (viii) A-B-C inventory analysis
- (ix) Lean Manufacturing.

$$(4 \times 2) + (6 \times 2) = 20$$