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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING**

**TEST – 1**

**Winter Semester:** 2021-22

**Course Code:** MEC 311

**Course Name:** Industrial Engineering Techniques

**Program & Sem:** B.Tech. & VI Sem

**Date:** 26<sup>th</sup> April 2022

**Time:** 01:30 PM to 02:30 PM

**Max Marks:** 30

**Weightage:** 15%

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**Instructions:**

- (i) *Read all the questions carefully and answer accordingly.*
  - (ii) *Use of calculator is permitted.*
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**Part A [Memory Recall Questions]**

**Answer all the Questions. Each question carries 1 mark.**

**(6Qx1M=6M)**

1. The process of using the present and past conditions for analysing future aspects is classified as \_\_\_\_\_.
  - a) Forecasting
  - b) Term Analysis
  - c) Expectation analysis
  - d) None of the above
  
2. The purpose of \_\_\_\_\_ is to divide all of a company's stock into three groups.
  - a) ABC analysis
  - b) EOQ
  - c) Safety stock
  - d) None of the above
  
3. The activities related to coordinating, controlling and planning flow of inventory are classified as \_\_\_\_\_.
  - a) Throughout management
  - b) Decisional management
  - c) Inventory management
  - d) Manufacturing management

4. To help \_\_\_\_\_ in taking inventory decisions is one of the objectives of inventory control.
  - a) Workers
  - b) Management
  - c) Consumers
  - d) None of the above
  
5. ABC analysis is based on \_\_\_\_\_.
  - a) Moore's principle
  - b) Monte Carlo's principle
  - c) Game theory
  - d) Pareto's principle
  
6. EOQ is the quantity at which the carrying cost is \_\_\_\_\_.
  - a) Minimum
  - b) Equal to the cost of ordering
  - c) Less than the cost of ordering
  - d) Cost of overstocking

[1M] (CO NO 1) [Knowledge Level]

### Part B [Thought Provoking Questions]

**Answer both the Questions. Each question carries 5 marks. (2Qx5M=10M)**

7. Economic order quantity (EOQ) is the ideal order quantity a company should purchase to minimize inventory costs. Raymond Ltd. has been placing an annual order of 48000 units at a price of \$20 per unit. Its carrying cost is 15% of purchase cost and the order cost is \$12 per order. a) What is the most economical order quantity? b) How many orders need to be placed?

[5M] (CO NO 1) [Comprehension Level]

8. A television dealer finds that cost of holding a television stock for a week is Rs. 30 and the cost of unit shortage is Rs. 70. For one particular model of television the probability distribution of weekly sales is as follows:

Weekly Sales	0	1	2	3	4	5	6
Probability	0.05	0.10	0.20	0.25	0.20	0.15	0.05

How many units per week should the dealer order?

[5M] (CO NO 1) [Comprehension Level]

**Part C [Problem Solving Questions]**

**Answer both the Questions. Each question carries 7 marks.**

**(2Qx7M=14M)**

9. Forecasting is one of three components of an organization’s Demand Planning, Forecasting, and Management process. There is a cost trade-off between cost of errors in forecasting and cost of quality forecasts that must be balanced. Forecast metric systems should capture bias and accuracy. The table below shows the demand for a particular brand of fax machine in a department store in each of the last nine months.

Month	1	2	3	4	5	6	7	8	9
Demand	10	12	13	17	15	19	20	21	20

- a) Calculate a three-month moving average for months three to nine. What would be your forecast for the demand in month ten?
- b) Apply exponential smoothing with a smoothing constant of 0.3 to derive a forecast for the demand in month ten.
- c) Which of the two forecasts for month ten do you prefer and why?

[7M](CO NO 1)[Comprehension Level]

10. ABC analysis is an inventory management technique that determines the value of inventory items based on their importance to the business. ABC ranks items on demand, cost and risk data, and inventory managers group items into classes based on those criteria. Sam has a stationery business, and over time, his business has achieved tremendous success. He decides to implement the ABC inventory categorization in his business model. Help him categorize the products to allow his business to seek more profit.

Item	Annual number of units sold	Price per unit
Paper clips	21000	£0.50
Staples	10000	£0.50
Correction fluid	16000	£1.50
Diaries	50000	£3.50
Erasers	15000	£0.10
Notepads	40000	£2.00
Pencils	80000	£0.03
Pens	120000	£0.05
Rulers	15000	£0.25
Staplers	10000	£1.50

[7M](CO NO 1) [Comprehension Level]



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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING**

**TEST – 2**

**Winter Semester:** 2021-22

**Course Code:** MEC 311

**Course Name:** Industrial Engineering Techniques

**Program & Sem:** B.Tech. & VI Sem

**Date:** 1<sup>st</sup> June 2022

**Time:** 01:30 PM to 02:30 PM

**Max Marks:** 30

**Weightage:** 15%

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**Instructions:**

- (iii) *Read all the questions carefully and answer accordingly.*
  - (iv) *Use of normal distribution table is permitted.*
  - (v) *Use of control chart constants are permitted.*
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**Part A [Memory Recall Questions]**

**Answer all the Questions. Each question carries ONE mark.**

**(6Qx1M=6M)**

1. Which tool is useful as cause analysis tool?
  1. Fishbone diagram
  2. Check sheet
  3. Stratification
  4. None of the above
  
2. Which type of chart uses the rule of 20:80?
  - a) Scatter diagram
  - b) Histogram
  - c) Check sheet
  - d) Pareto chart
  
3. X bar should never be interpreted when?
  - a) R chart shows out of control points
  - b) X bar chart shows out of control points
  - c) The process mean is not known
  - d) None of the above

4. Which of the following statement is true?
- a) PERT and CPM are both probabilistic techniques
  - b) PERT and CPM are both deterministic techniques
  - c) PERT is considered as deterministic and CPM as a probabilistic technique
  - d) PERT is considered as probabilistic and CPM as a deterministic technique
5. Which of the option is not a notable challenge while scheduling a project?
- a) Deadlines exist
  - b) Independent activities
  - c) Too many workers may be required
  - d) Costly delay
6. The standard deviation for a PERT diagram is calculated by?
- a) Taking the sum of the variance on all the nodes, then find the square root
  - b) Taking the sum of the standard deviations on the nodes on the critical path
  - c) Taking the sum of the standard deviations on all the nodes
  - d) Taking the sum of variances on nodes of critical path & find the square root
- [6M] (CO NO 2,3) [Knowledge Level]

### **Part B [Thought Provoking Questions]**

**Answer all the Questions. Each question carries FOUR marks. (3Qx4M=12M)**

7. Fishbone diagram or cause and effect analysis tool is considered one of the seven basic quality tools. It identifies many possible causes for an effect or problem. It can be used to structure a brainstorming session. It immediately sorts ideas into useful categories. Perform the Fishbone analysis for poor performance of Indian cricket team in recent T20 World cup (Effect) taking into consideration various reasons (Causes) for the same and depict them in the diagram.
- [4M] (CO NO 2) [Comprehension Level]
8. A histogram graph is a bar graph representation of data. It is a representation of a range of outcomes into columns formation along the x-axis. In the same histogram, the number count or multiple occurrences in the data for each column is represented by the y-axis. It is the easiest manner that can be used to visualize data distributions. A discipline elective has 18 students registered for it. Each student has obtained different marks. The marks of the students are given: 9, 8, 16, 9, 17, 26, 15, 7, 15, 19, 17, 9, 11, 18, 23, 19, 14, 31. Plot the histogram for the given data set.
- [4M] (CO NO 2) [Comprehension Level]

9. A PERT chart network diagram includes numbered nodes, directional arrows and divergent arrows that illustrate the minimum time and duration of activities. Directional arrows represent the activities, while nodes are milestones. A small project consisting of eight activities has the following characteristics. Draw the network diagram indicating the flow of activities.

Activity	Preceding activity
A	--
B	--
C	A
D	A
E	A
F	B,C
G	D
H	E,F,G

[4M] (CO NO 3) [Comprehension Level]

### Part C [Problem Solving Questions]

Answer the Question. The question carries TWELVE marks.

(1Qx12M=12)

10. The main objective in the analysis through PERT is to find out the completion for a particular event within specified date. The PERT approach takes into account the uncertainties. The use of PERT chart gives project managers a tool to estimate the time and resources needed to complete their project tasks, which is crucial during the initiation and planning phases. A project is composed of 10 activities whose time estimates are listed below.

Activities	Time in weeks		
	$t_o$	$t_m$	$t_p$
1-2	4	6	8
1-3	2	3	10
1-4	6	8	16
2-4	1	2	3
3-4	6	7	8
3-5	6	7	14
4-6	3	5	7
4-7	4	11	12
5-7	2	4	6
6-7	2	9	10

- a.) Draw the network diagram and find the expected project completion time.
- b.) Calculate the variance and standard deviation for the project.
- c.) If the project due date is 24 days, what is the probability of meeting the due date?
- d.) What due date has 67% chance of being met?

[12M] (CO NO 3) [Comprehension Level]

**Normal Distribution Table for positive value of Z**

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9924	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9958	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986



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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING**

**END TERM EXAMINATION**

**Winter Semester:** 2021-22

**Course Code:** MEC 311

**Course Name:** Industrial Engineering Techniques

**Program & Sem:** B.Tech. & VI Sem

**Date:** 30<sup>th</sup> June 2022

**Time:** 9:30 AM to 12:30 PM

**Max Marks:** 100

**Weightage:** 50%

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**Instructions:**

- (vi) *Read the question properly and answer accordingly.*
  - (vii) *Question paper consists of 3 parts.*
  - (viii) *Use of normal distribution table is allowed.*
  - (ix) *Use of control chart constants are permitted.*
- 

**Part A (Memory recall - Quiz)**

**Answer ALL Questions. Each question carries 6 marks**

**(4Qx6M=24)**

1. For subgroup size 4, data of mold filling process is collected. Mean of  $\bar{X}$  bar is calculated as 10.24667 and mean of range is calculated as 1.46. What will be the control limits for  $\bar{X}$  bar chart (UCL, LCL) and for R chart (UCL, LCL)? The constant values are  $A_2= 0.729$ ,  $D_3=0$ ,  $D_4=2.282$ .
2. The demand for a product in each of the last five months is shown below. Month 1 - 1300, Month 2 - 1700, Month 3 - 1900, Month 4 - 2300 and Month 5 - 2400. Apply exponential smoothing with a smoothing constant of 0.8 and generate a forecast for demand in Month 6.
3. Suppose an item of asset acquired at the cost of Rs. 50000 has estimated the use of 20000 hours. The estimated salvage value is Rs. 4000. During the first year, the said equipment used 4000 hours. Calculate the depreciation amount for first year. Suppose in the second year the said equipment used 8000 hours. Calculate the depreciation amount for second year.



4. The utility data for a network is given below:

Activity	Normal time (days)	Normal cost (Rs)	Crash time (days)	Crash cost (Rs)
1-2	8	100	6	200
1-3	4	150	2	350
2-4	2	50	1	90
3-4	5	100	1	200

Indirect cost is Rs. 100 per day. Crash the project by one day and determine its associated cost.  
(CO NO 1, 2, 3, 4) [Knowledge Level]

### Part B (Thought Provoking Questions)

**Answer ALL Questions. Each question carries 12 marks**

**(3Qx12M=36M)**

5. Forecasting is a technique that uses historical data as inputs to make informed estimates that are predictive in determining the direction of future trends. Businesses utilize forecasting to determine how to allocate their budgets or plan for anticipated expenses for an upcoming period of time. Xylo Computer Services assembles customized personal computers from generic parts. Formed and operated by part-time post graduate students Vinayak and Joshi, the company has had steady growth since it started. The company assembles computers mostly at night, using part-time students. Vinayak and Joshi purchase generic computer parts in volume at a discount from a variety of sources whenever they see a good deal. Thus, they need a good forecast of demand for their computers so that they will know how many parts to purchase and stock. They have compiled demand data for the last 12 months as reported below.

- Calculate a six-month moving average for each month. What would be the forecast for the demand in month 13?
- Apply exponential smoothing with a smoothing constant of 0.4 to derive a forecast for the demand in month 13.
- Which of the two forecasts for month 13 do you prefer and why?

Period	Month	Demand
1	January	37
2	February	40
3	March	41
4	April	37
5	May	45
6	June	50
7	July	43
8	August	47

9	September	56
10	October	52
11	November	55
12	December	54

(CO NO 1) [Comprehension Level]

6. A fishbone diagram is a visual way to look at cause and effect. It is a more structured approach than some other tools available for brainstorming causes of a problem (e.g., the Five Whys tool). The problem or effect is displayed at the head or mouth of the fish. They are useful for determining the root cause of a problem or challenge. By dissecting the problem and recording its possible causes in writing, this process can often illuminate potential solutions. Perform the Fishbone analysis for “Road accidents” (Effect) taking into consideration various reasons (Causes) for the same and depict them in the diagram.

(CO NO 2) [Comprehension Level]

7. When the capacity of a process is understood and documented, it can be used for measuring continual improvement using trends over time, prioritizing the order of process improvements to be made, and determining whether or not a process is capable of meeting customer requirements. In this regard explain what is process capability? Why is it important? A sample is taken from a process with a sample average of 26 and a sample standard deviation of 1.1. The specifications for a process are 38 and 16. What are the Cp and Cpk for the process?

(CO NO 2) [Comprehension Level]

### Part C (Problem Solving Questions)

**Answer both the Questions. Each question carries 20 marks (2Qx20M=40M)**

8. The critical path method (CPM) is a technique where you identify tasks that are necessary for project completion and determine scheduling flexibilities. A critical path in project management is the longest sequence of activities that must be finished on time in order for the entire project to be complete. It is an algorithm for planning, managing and analyzing the timing of a project. The step-by-step CPM system helps to identify critical and non-critical tasks from projects' start to completion and prevents temporary risks. A project has the following times schedule.

Activity	Times in weeks
1-2	2
1-3	2
1-4	1
2-6	4
3-7	5
3-5	8

4-5	3
5-9	5
6-8	1
7-8	4
8-9	3

- a.) Draw the network diagram and determine the critical path.  
b.) Determine the early start and late start in respect of all node points and calculate float for each activity. (CO NO 3) [Comprehension Level]

9. A break-even analysis is a financial calculation that weighs the costs of a new business, service or product against the unit sell price to determine the point at which you will break even. In other words, it reveals the point at which you will have sold enough units to cover all of your costs. It is the level of production at which the costs of production equal the revenues for a product. Fixed costs of an enterprise is Rs. 2,50,000 and the variable cost and the selling price of the product is Rs. 30 per unit and Rs. 50 per unit respectively. The company expects to sell 13,500 units of the product. Draw a break-even chart depicting the break-even point and determine the profit earned at this current situation and the margin of safety. Calculate the number of products the company needs to sell to make a profit of 25,000. Determine the angle of incidence.

(CO NO 4) [Comprehension Level]