

7E1747

Roll No. \_\_\_\_\_

Total No. of Pages: 2

**7E1747**

**B. Tech. VII - Sem. (Main) Exam., Feb.- March - 2021**  
**PEC Mechanical Engineering**  
**7ME5 – 11 I. C. Engines**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 82**

**Min. Marks: 29**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- |  |     |
|--|-----|
| Q.1 What is objectives of I. C. Engine?                                    | [2] |
| Q.2 What is Thermal efficiency?  | [2] |
| Q.3 Draw the figure of combustion chamber.                                 | [2] |
| Q.4 What is Knocking?  | [2] |
| Q.5 What is the compression of 4 – stroke diesel engine?                   | [2] |
| Q.6 What is Turbulence?  | [2] |
| Q.7 Write the name of all parts of 4 – stroke petrol engine.               | [2] |
| Q.8 What is delay period?  | [2] |
| Q.9 Draw the figure of cooling system of I. C. Engine with all components. | [2] |
| Q.10 What is electronic ignition system?                                   | [2] |

## **PART – B**

**(Analytical/Problem solving questions)**

**[4×8=32]**

**Attempt any four questions**

- Q.1 Explain the lubrication system in I. C. engine. [8]  
Q.2 Explain Indicated Horse Power (IHP) and also derive formula of IHP. [8]  
Q.3 Explain the types of Combustion Chamber. [8]  
Q.4 Explain fuel –air cycle with diagram. [8]  
Q.5 Describe the different method of super charging with diagram and also describe the Thermodynamics cycle of supercharging. [8]  
Q.6 Explain the effect of engine variables an ignition lag in S. I. engine. [8]  
Q.7 Explain firing order in the engine. [8]

## **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[2×15=30]**

**Attempt any two questions**

- Q.1 What is the function of carburetor and also explain all the parts of carburetor with diagram. [15]  
Q.2 Explain the injection system in C. I. engine also explain the types of injection system. [15]  
Q.3 A two stroke C. I. engine delivers 500 kW while using 1000 kW to overcome frictional losses. It consume 2300 kg of fuel per hour at an air fuel ratio of 20 to 1. The heating value of fuel is 42000 kJ/kg. Find the – [15]  
(a) Indicated Power  
(b) Mechanical Efficiency  
(c) Indicated Thermal Efficiency  
(d) Brake Thermal Efficiency  
Q.4 Explain water cooling system with suitable diagram. What is the function of fins? [15]  
Q.5 Explain why rich or lean mixtures are supplied during idling normal running and maximum power range in a spark ignition engine. Give the value of A/F ratio. [15]
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**7E1748**

**B. Tech. VII - Sem. (Main) Exam., Feb.- March - 2021**

**PEC Mechanical Engineering**

**7ME5 – 12 Operations Research**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 82**

**Min. Marks: 29**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 Give any one definition of operations research.
- Q.2 Why is the study of operations research important to the decision maker?
- Q.3 State clearly the basic assumptions that are made in LPP.
- Q.4 Give a general mathematical formulation of L. P. problem. Indicate all terms.
- Q.5 What is an artificial variable and why it is necessary to introduce it?
- Q.6 What are the useful aspects of duality in LPP?
- Q.7 What is degeneracy problem in transportation?

Q.8 Define 'pure strategy' and 'mixed strategy' in a game.

Q.9 What are the different types of inventory in industries?

Q.10 What are the main characteristics of queuing system?

## **PART – B**

**(Analytical/Problem solving questions)**

**[4×8=32]**

**Attempt any four questions**

Q.1 A firm manufacturing headache pills in two sizes A and B. Size A contain 2 grains of aspirin, 5 grains of bicarbonate and 1 grain of codeine. Size B contains 1 grain of aspirin, 8 grains of bicarbonates and 6 grains of codeine. It is found by users that it requires at least 12 grains of aspirin, 74 grains of bicarbonate and 24 grains of codeine for providing immediate effect. It is required to determine the least number of pills a patient should take to get immediate relief. Formulate the problem as a standard LPP.

Q.2 Solve the LPP given below by graphical method and shade the region representing the feasible solution: Minimize  $Z = 2 X_1 - 10 X_2$

Subject to  $X_1 - X_2 \geq 0$ ,  $X_1 - 5 X_2 \geq -5$ , and  $X_1, X_2 \geq 0$ .

Q.3 Define slack and surplus variables as involved in the LPP. How are these variables useful in solving a LPP?

Q.4 Explain the concept involved in the Gomory's cutting plane method.

Q.5 What is an inventory system? Explain clearly the different costs that are involved in Inventory problems.

Q.6 Describe any two methods used for decision making with uncertainty. Explain each method with example.

Q.7 Explain Monte Carlo simulation method and give the situations where this method is useful.

## PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [2×15=30]

Attempt any two questions

Q.1 A manufacturing company has just developed new product. On the basis of past experience, a product such as this will either be successful, with an expected gross return of rupees 100,000, or unsuccessful with an expected gross return of rupees 20,000. Similar products manufactured by company have a record of being successful about 50% of the time. The production and marketing costs of new product are expected to be rupees 50,000.

The company is considering whether to market this new product or to drop it. Before making its decision, however, a test marketing effort can be conducted at a cost of rupees 10,000. Based on the past experience, test marketing results have been favorable about 70% of time. Furthermore, products favorably tested have been successful 80% of the time. However, when the test marketing results has been unfavorable, the product has only been successful 30% of the time. What course of action should the company pursue?

Q.2 Describe a general transportation problem. Explain how to determine an initial basic feasible solution to the problem using Vogel's method.

Q.3 Show how to solve a  $2 \times 2$  two person zero-sum game without any saddle point.

Q.4 Arrival rate of telephone calls booth are according to Poisson distribution with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed, with mean 3 minutes.

- (a) Determine the Probability that a person arriving at the booth will have to wait.
- (b) Find the average queue length that is formed from time to time.
- (c) The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least four minutes for the phone. Find the increase in flow rate of arrival which will justify a second booth.
- (d) What is the probability that an arrival will have to wait for more than 10 minutes before the phone is free?
- (e) What is the probability that he will have to wait for more than 10 minutes before the phone is available and the call is also complete?

Q.5 A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at ₹ 50 per unit from manufacturer. The cost of ordering and transportation from the manufacturer is ₹ 75 per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find –

- (a) The economic lot size
  - (b) The total optimal cost (including the capital cost)
  - (c) The total weekly profit if the item is sold for ₹ 55 per unit
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**7E1749**

**B. Tech. VII - Sem. (Main) Exam., Feb.- March - 2021**  
**PEC Mechanical Engineering**  
**7ME5 – 13 Turbomachines**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 82**

**Min. Marks: 29**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 Explain turbo machines.
- Q.2 Define Mass flow rate Parameter.
- Q.3 Explain surging.
- Q.4 Define work done factors.
- Q.5 Explain Reciprocating Compressor.
- Q.6 Explain slip and slope factor.
- Q.7 Explain Cavitation.
- Q.8 Explain coefficient of discharge.

Q.9 Define indication diagram.

Q.10 Explain performance curve.

### **PART – B**

**(Analytical/Problem solving questions)**

**[4×8=32]**

**Attempt any four questions**

Q.1 Explain 2<sup>nd</sup> law of thermodynamics applied to turbo machines.

Q.2 Define Range of specific speeds for various turbo machine.

Q.3 Explain centrifugal compressor and velocity diagram.

Q.4 Explain axial flow compressor and velocity diagram.

Q.5 Define working and principle of Reciprocating Compressor.

Q.6 Explain velocity triangles.

Q.7 Define theory of air vessels.

### **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[2×15=30]**

**Attempt any two questions**

Q.1 Define scope and outcome of turbo machines.

Q.2 Derive Euler's turbine equation.

Q.3 Define Degree of reaction for centrifugal compressor.

Q.4 Define cascade test with an example.

Q.5 Explain the principle of single acting and double acting reciprocating pumps.

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Total No. of Pages: **4**

**7E1750**

**B. Tech. VII - Sem. (Main) Exam., Feb.- March - 2021**

**OE -I Open Elective-I Mechanical Engineering**

**7ME6 – 60.1 Finite Element Analysis**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 82**

**Min. Marks: 29**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 Discuss importance and application of FEM.
- Q.2 What do mean by shape function?
- Q.3 Define Meshing.
- Q.4 Explain Node.
- Q.5 What do you understand by bandwidth and semi bandwidth?
- Q.6 Explain uniqueness of a solution.

Q.7 Describe the formulation for plane stress and plane strain problems.

Q.8 Explain 1-Dimensional heat transfer for a bar element.

Q.9 Define compatibility.

Q.10 Explain Element continuity.

### **PART – B**

**(Analytical/Problem solving questions)**

**[4×8=32]**

**Attempt any four questions**

Q.1 Solve  $\int_3^6 \frac{1}{x} \cdot dx$  for two gauss points.

Q.2 What do you mean by “Residual”? Explain the procedure of sub domain method.

Q.3 Derive shape functions for CST triangular element in local coordinates.

Q.4 Write the steps of Ritz’s method. Explain different boundary conditions.

Q.5 Explain principal of minimum potential energy with the help of suitable example.

Q.6 Solve the equations using gauss elimination method –

$$X_1 + 2X_2 + X_3 - X_4 = 0$$

$$2X_2 + 3X_3 + 3X_4 = 8$$

$$X_1 - X_2 - 3X_3 - 4X_4 = -8$$

$$X_1 + X_2 + 5X_3 - 2X_4 = -8$$

Q.7 Derive global stiffness matrix for a two spring system using local stiffness matrix for each element.

## PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)      [2×15=30]

Attempt any two questions

- Q.1 Figure – 1 depicts a system of three linearly elastic springs supporting three equal weights  $W$  suspended in a vertical plane. Treating the springs as finite elements, determine the vertical displacement of each weight.

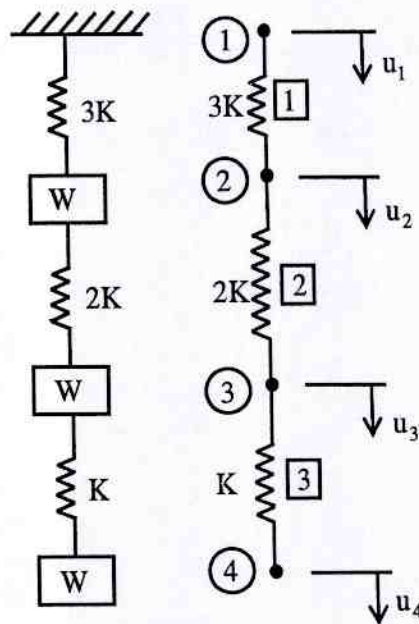
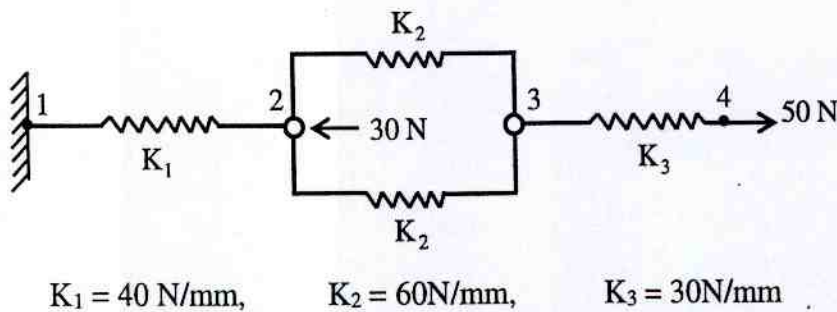


Fig.-1

- Q.2 Using Minimum potential energy approach solve for displacement 2, 3 and 4 and reaction force at node 1 for following node 3 is rigid -



Q.3 Write p and h methods of mesh refinement.

Q.4  $\frac{d^2u}{dx^2} + u = 1$  ,  $0 \leq x \leq 1$ , solve the differential equation by Galerkin's Method of weighted residuals.

Q.5 Write short note on the following –

- (a) Convergence of solution & continuity
  - (b) Consistent mass matrix for two noded bar element
  - (c) Static condensation by symmetric gauss elimination
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Total No. of Pages: 2

**7E1722**

**B. Tech. VII - Sem. (Main) Exam., Feb.- March - 2021**  
**OE - I Open Elective-I Computer Science & Engineering**  
**7CS6 – 60.1 Quality Management/ISO 9000**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 82**

**Min. Marks: 29**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 Define quality
- Q.2 Define concept of service quality.
- Q.3 What is sampling?
- Q.4 What is process quality?
- Q.5 Define term "Audit"
- Q.6 What is Bench Marking?
- Q.7 What are the benefits of TQM?
- Q.8 Define JIT
- Q.9 What is Kaizen?
- Q.10 What is reliability?

## **PART – B**

**(Analytical/Problem solving questions)**

**[4×8=32]**

**Attempt any four questions**

- Q.1 Write and explain the concept of product quality.
- Q.2 Explain the dimensions of quality in detail.
- Q.3 Briefly describe the 7 QC tools and its benefits.
- Q.4 What are the main obstacles in implementing TQM?
- Q.5 Explain JIT and its implementation.
- Q.6 Explain Taguchi loss function view of quality.
- Q.7 Explain the concept of six sigma in product development.

## **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[2×15=30]**

**Attempt any two questions**

- Q.1 Explain in brief the purpose of ISO 9000 series of quality standards. Also define quality audit and quality circles.
  - Q.2 Service Industries have special requirements that the manufacturing bias TQ cannot fulfill. Mention any five important requirements and dimensions of service quality.
  - Q.3 What is Analysis of Variance (ANOVA)? Explain one way analysis of variance with the help of a suitable example. Also describe how it is different from two way analysis of variance.
  - Q.4 What is Process Failure Mode & Effect Analysis (PFMEA)? Explain various variable used for evaluation along with steps to complete a PFMEA in detail.
  - Q.5 Explain six sigma in product development along with its requirement and benefits in detail.
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Total No. of Pages: 2

**7E1751**

**B. Tech. VII - Sem. (Main) Exam., Feb.- March - 2021**  
**OE -I Open Elective-I Mechanical Engineering**  
**7ME6 – 60.2 Quality Management**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 82**

**Min. Marks: 29**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 Define inspection and give its objectives.
- Q.2 What is the basic difference between Inspection and Quality Control?
- Q.3 What is JIT production? What are its aims?
- Q.4 Why is a multi-function worker required in JIT?
- Q.5 State the advantages of quality control.
- Q.6 What do you understand by Bench Marking?
- Q.7 What is Leadership?

- Q.8 Discuss the importance and requirement of the inspection department in a manufacturing concern.
- Q.9 What is the role of automation in JIT?
- Q.10 Define sampling distribution.

### **PART – B**

**(Analytical/Problem solving questions)**

**[4×8=32]**

**Attempt any four questions**

- Q.1 Explain the basic elements of JIT.
- Q.2 Discuss the importance of quality control in an industry why is statistical quality control preferred. Explain.
- Q.3 Explain the process of Bench Marking. Is it effective in bringing organization changes?
- Q.4 What is TQM and explain Deming's approach to TQM?
- Q.5 What do you understand by product quality improvement? Explain Taguchi Method.
- Q.6 Explain the secrets and steps towards establishing a successful Quality Circle (QC) program in a firm.
- Q.7 Explain ISO 9000 in detail and also discuss their importance.

### **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[2×15=30]**

**Attempt any two questions**

- Q.1 List out the seven new management tools. Explain them briefly.
- Q.2 Explain the customer perception of quality. Discuss about the dimensions of product and service quality.
- Q.3 What is reliability? Discuss reliability in series and parallel connection systems.
- Q.4 Narrate the process of conducting quality audit in a manufacturing firm and usage of various control charts.
- Q.5 Justify how Six Sigma can be used continuous quality improvement.
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7E7012

Roll No. \_\_\_\_\_

Total No of Pages: **3**

**7E7012**

**B. Tech. VII - Sem. (Back) Exam., Feb.-March - 2021**

**Mechanical Engineering**

**7ME2A Refrigeration and Air-Conditioning**

**Time: 2 Hours**

**Maximum Marks: 48**  
**Min. Passing Marks: 15**

*Instructions to Candidates:*

*Attempt **three** questions, selecting **one** question each from any three unit. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No.205)*

1. NIL

2. NIL

### **UNIT- I**

Q.1 (a) What are the limitations of simple vapour compression system? How is the system adapted to achieve 50°C temperature? Describe with a neat sketch. [8]

(b) Describe with a neat sketch the liquid vapour heat exchanger. [8]

**OR**

Q.1 (a) Define air compressor system with the help of a neat sketch. [8]

(b) Describe cascade system with the help of a neat sketch. [8]

### **UNIT- II**

Q.2 (a) What are the considerations for an aircraft refrigeration system? [8]

(b) Describe Brayton cycle with regenerative heat exchanger. [8]

**OR**

- Q.2 (a) A gas refrigeration system working on Reversed Brayton cycle at a temperature of 240 K at the inlet of the compressor. If the temperature at the end of constant pressure cooling is 300 K and the rise in temperature of air in refrigerator is 40 K, then find the net work of compression will be? (Take  $C_p = 1 \text{ kJ/kg-k}$ ) [8]
- (b) Explain Regenerative type aircraft refrigeration cycle. [8]

### **UNIT- III**

- Q.3 (a) What are the commonly used refrigerants in the vapour absorbent system? Evaluate two commonly used refrigerants in such system. [8]
- (b) Describe Lithium Bromide - water system with the help of a neat sketch. [8]

**OR**

- Q.3 (a) Describe thermo electric refrigeration system. [8]
- (b) Describe the working of a Rotary compressor. What are advantages of a centrifugal compressor? [8]

### **UNIT- IV**

- Q.4 (a) What is the effect of heat of body on the work performance? [8]
- (b) Describe the term wet bulb temperature and humidity ratio. How these are measured? [8]

**OR**

- Q.4 (a) The humidity ratio of atmospheric air at 26°C DBT and 740 mm of 1 Hg is 0.016 kJ/kg of dry air. Determine- [8]
- (i) Partial pressure of water vapour
  - (ii) Specific Enthalpy
  - (iii) Dew point temperature
  - (iv) Relative humidity
- (b) Describe- [8]
- (i) Dew point temperature
  - (ii) Cooling coils

## **UNIT- V**

- Q.5 (a) With the help of a neat sketch, explain the year round air conditioning system. [8]
- (b) Describe the psychrometric calculation for cooling. [8]

**OR**

- Q.5 Explain the following- [4×4=16]
- (a) ERSHF
  - (b) GSHF
  - (c) RSHF
  - (d) Heating load estimation
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**7E7013**

Roll No. \_\_\_\_\_

Total No of Pages: **4****7E7013****B. Tech. VII - Sem. (Back) Exam., Feb.-March - 2021****Mechanical Engineering****7ME3A Operations Research****Time: 2 Hours****Maximum Marks: 48****Min. Passing Marks: 15***Instructions to Candidates:*

*Attempt three questions, selecting one question each from any three unit. All Questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL2. NIL**UNIT- I**

- Q.1 (a) What is Operations Research model? Discuss three Operations Research models. Discuss the various steps used in solving Operations Research problems. [10]
- (b) What are the essential characteristics of Operations Research? [6]

**OR**

- Q.1 (a) Solve the following LPP by Simplex method – [8]
- Maximize  $z = 3x_1 + 2x_2$
- Subject to
- $x_1 + 2x_2 \leq 4$
- $3x_1 + 2x_2 \leq 14$
- $x_1 - x_2 \leq 3$
- $x_1, x_2 \geq 0$

- (b) Five jobs are to be assigned to 5 machines to minimize the total time required to process the jobs on machines. The times in hours for processing each job on each machine are given in the matrix below. By using assignment algorithm make the assignment for minimizing the time of processing. [8]

Machines (Time in hours)					
↓					
Jobs	V	W	X	Y	Z
A	2	4	3	5	4
B	7	4	6	8	4
C	2	9	8	10	4
D	8	6	12	7	4
E	2	8	5	8	8

## UNIT- II

Q.2 Use Branch and Bound algorithm to solve the following Integer Linear Programming [16]

$$\text{Maximize } 9x_1 + 5x_2 + 6x_3 + 4x_4$$

Subject to

$$6x_1 + 3x_2 + 5x_3 + 2x_4 \leq 10$$

$$x_3 + x_4 \leq 1$$

$$-x_1 + x_3 \leq 0$$

$$-x_2 + x_4 \leq 0$$

$$x_j \in \{0, 1\} \quad j = 1, \dots, 4$$

**OR**

- Q.2 (a) A machine A costs ₹ 9000. Annual operating costs are ₹ 200 for the first year and then increases by ₹ 2000 every year. Determine the best age at which the machine A is to be replaced. If the optimum replacements policy is followed, what will be the average yearly cost of owning and operating the machine? Assume that the machine has no resale value when replaced and that future costs are not discounted. [8]
- (b) Machine B costs ₹ 10000. Annual operating costs are ₹ 400 for the first year and then increases by ₹ 800 every year. You have now a machine of type A, which is one year old. Should you replace it with B, and if so, when? [8]

**UNIT- III**

- Q.3 In a departmental store one cashier is there to serve the customers. And the customers pick-up their needs by themselves. The arrival rate is 9 customers for every 5 minutes and the cashier can serve 10 customers in 5 minutes. Assuming Poisson arrival rate and exponential distribution for service rate, find - [16]
- (a) Average number of customers in the system
- (b) Average number of customers in the queue or average queue length
- (c) Average time a customer spends in the system
- (d) Average time a customer waits before being served

**OR**

- Q.3 (a) Enlist the properties of the game. What assumptions are made in game theory? [6]
- (b) Obtain the optimal strategies for both players and the value of the game for two-person zero-sum game whose payoff matrix is given in Table- [10]

Player A	Player B	
	B <sub>1</sub>	B <sub>2</sub>
A <sub>1</sub>	-6	7
A <sub>2</sub>	4	-5
A <sub>3</sub>	-1	-2
A <sub>4</sub>	-2	5
A <sub>5</sub>	7	-6

## UNIT- IV

Q.4 (a) Define the term Decision theory. Describe decision models based on the criterion of degree of certainty. [6]

(b) A stockist purchases an item at the rate of ₹ 40 per piece from a manufacturer. 2,000 units of the item are required per year. What should be the order quantity per order if the cost per order is ₹ 15 and the inventory charges per year are 20%? [10]

OR

Q.4 (a) Discuss about significance of inventory. [6]

(b) The demand for an item is 8000 units per annum and the unit cost is Re. 1/- . Inventory carrying charges of 20% of average inventory cost and ordering cost is ₹ 12.50 per order. Calculate optimal order quantity, optimal order time, optimal inventory cost and number of orders. [10]

## UNIT- V

Q.5 What are the advantages and disadvantages of simulation? Explain Monte – Carlo simulation. [16]

OR

Q.5 A T. V. dealer finds that costs of holding a television in stock for a week is ₹ 20. Customers who cannot obtain new television immediately tend to go to another dealer and the estimates that for every customer who does not get immediate delivery he loses on an average ₹ 200. For one particular model of TV the probabilities of demand of 0, 1, 2, 3, 4 and 5 in a week are 0.05, 0.1, 0.2, 0.2 and 0.15 respectively. How many televisions per week should the dealer order? [16]

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7E7014

Roll No. \_\_\_\_\_

Total No of Pages: 4

**7E7014**

**B. Tech. VII - Sem. (Back) Exam., Feb.-March - 2021**

**Mechanical Engineering**

**7ME4A Turbomachines**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 48**

**Min. Marks: 15**

*Instructions to Candidates:*

*Attempt **three** questions, selecting **one** question each from any three unit. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No.205)*

1. NIL

2. NIL

**UNIT- I**

Q.1 (a) What is turbomachine? Explain the classification of turbomachines [8]

(b) Derive Euler's pump equation. [8]

**OR**

Q.1 (a) What is the significance of specific speed of turbomachine? Write the expression for specific speed of centrifugal pump. [8]

(b) Explain dimensional analysis applied to compressible flow machines with a suitable example. [8]

## UNIT- II

- Q.2 (a) What is the isentropic and polytropic efficiency of a dynamic compressor? Explain difference between them. [6]
- (b) A reciprocating compressor delivers 5 kg of air per minute at a pressure of 75 N/cm<sup>2</sup>. The pressure and temperature of the air before compression are 10 N/cm<sup>2</sup> and 16°C respectively and the compression process may be assumed to follow the law  $PV^{1.2} = \text{constant}$ . If the rate of heat transfer from the cylinder is estimated to be 1 kW, calculate the power required/or the compression. Take  $C_p = 1.00 \text{ kJ/kgK}$ . [10]

### OR

- Q.2 (a) Show on a temperature entropy diagram a frictionless adiabatic compression. Shade the area which represents the work done on the gas during compression. In the same diagram show an adiabatic compression with friction and shade and label the area which represents the extra work required due to friction. [8]
- (b) The pressure of air being compressed in a centrifugal compressor is doubled. The inlet temperature is 27°C and final temperature is 105°C. Calculate the isentropic efficiency of the compressor and power required to drive it, if 30 kg of air is compressed per minute.  $C_p = 1.00 \text{ kJ / KgK}$ ,  $C_v = 0.718 \text{ kJ/kgK}$  [8]

## UNIT- III

- Q.3 A centrifugal pump is delivering 0.216 m<sup>3</sup>/s of water against a head of 18 m; the speed of rotation of impeller being 600 r.p.m. The diameters at outer and inner periphery of the impeller are 600 mm and 300 mm respectively. The area of flow is constant at 0.084 m<sup>2</sup> from inlet to outlet of impeller. If the vanes of the impeller are bent at an angle of 35° to the tangent at exit, determine- [16]
- (a) Manometric efficiency
  - (b) Inlet vane angle
  - (c) Loss of head at inlet to impeller when the discharge is reduced by 35 percent

**OR**

- Q.3 (a) Explain the phenomenon of cavitation for axial flow pump. [6]
- (b) It is required to pump water out of deep well under a total head of 90 m. A number of identical pumps of design speed 1000 r.p.m. and specific speed 30 with a rated capacity of  $0.15 \text{ m}^3/\text{s}$  are available. How many pumps are required and how should they be connected whether in series or in parallel? [10]

**UNIT- IV**

- Q.4 An ideal open cycle gas turbine plant using air operates on an overall pressure ratio of 4 and between the temperature limits of 300 K and 1000 K. Assuming constant specific heats  $C_p = 1.00 \text{ kJ/kgK}$ ,  $C_v = 0.718 \text{ kJ/kgK}$ , evaluate the specific work output and thermal efficiency for each of the modifications below and state the percentage change from the basic cycle. Assume optimum stage pressure ratios, perfect intercooling and perfect regeneration. [16]
- (a) Basic cycle
- (b) Basic cycle with heat exchanger
- (c) Basic cycle with two stage intercooled compressor
- (d) Basic cycle with heat exchanger and intercooled compressor

**OR**

- Q.4 (a) Explain the advantages, disadvantages and applications of turbo prop engine. [8]
- (b) What is the difference between ideal and practical gas turbine cycles? [8]

## UNIT- V

Q.5 The final stage of a gas turbine rotor with part reaction blading is supplied with gas at  $15 \text{ N/cm}^2$  and a static temperature of  $680^\circ\text{C}$ . At mean section where the blade speed is  $200 \text{ m/s}$  the gas velocity at entry to the moving blades has a peripheral component  $430 \text{ m/s}$  and an axial component  $330 \text{ m/s}$ . The gas expands through the stage to  $10.4 \text{ N/Cm}^2$  with an actual drop of temperature of  $67^\circ\text{C}$ .  $C_p = 1.00 \text{ kJ/kgK}$ ,  $C_v = 0.718 \text{ kJ/kg K}$ . [16]

- (a) Calculate the work done per kg of gas and the peripheral gas velocity at exit.
- (b) Calculate the initial and final total temperature of the gas.
- (c) Assuming the annular area of the cross – section through the rotor to be constant, find the axial gas velocity at exit and the required blade angle.

OR

Q.5 A multi – stage gas turbine is to be designed with impulse stages and is to operate with an inlet pressure and temperature of  $60 \text{ N/cm}^2$  and  $900 \text{ K}$  and an outlet pressure of  $10 \text{ N/cm}^2$ . The isentropic efficiency of the turbine is likely to be 85 per cent. All the stages are to have a blade speed of  $250 \text{ m/s}$  and equal inlet and outlet gas velocities. Estimate the number of stages required. Assume  $C_p = 1.00 \text{ kJ/kgK}$  and ratio of specific heat is 1.333. [16]

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**7E7015**

Roll No. \_\_\_\_\_

Total No. of Pages: **7****7E7015****B. Tech. VII - Sem. (Back) Exam., Feb.-March - 2021****Mechanical Engineering****7ME5A Operations Management****Time: 2 Hours****[To be converted as per scheme]****Max. Marks: 48****Min. Marks: 15***Instructions to Candidates:*

*Attempt **three** questions, selecting **one** question **each** from any three unit. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No.205)*

1. NIL2. NIL**UNIT- I**

Q.1 (a) "Historically, much of the developments in production & operations management disciplines have centered on reduction of variability". Do you agree with this statement? Explain with a real life example. [6]

(b) Sunrise Baking Company markets doughnuts through a chain of food stores. It has been experiencing over and under production because of forecasting errors.

The following data is its demand in dozens of doughnuts for the past four weeks.

Doughnuts are made for the following day; For example, Sunday's doughnut production is for Monday's sales, Monday's production is for Tuesday's sales and

so forth. The bakery is closed on Saturday, so Friday's production must satisfy demand for both Saturday & Sunday- [10]

	4 weeks Ago	3 weeks Ago	2 weeks Ago	Last week
Monday	2200	2400	2300	2400
Tuesday	2000	2100	2200	2200
Wednesday	2300	2400	2300	2500
Thursday	1800	1900	1800	2000
Friday	1900	1800	2100	2000
Saturday				
Sunday	2800	2700	3000	2900

Make a forecast for this week on the following basis –

- (i) Daily, using a simple four - week moving average.
- (ii) Daily using a weighted average of 0.40, 0.30, 0.20 and 0.10 for the past four weeks.
- (iii) Sunrise is also planning its purchases of ingredients for bread production. If the bread demand had been forecasted for last week at 22,000 loaves and only 21,000 loaves were actually demanded, what would Sunrise's forecast be for this week using exponential smoothing with  $\alpha = 0.10$ ?

**OR**

Q.1 (a) How would forecasting be useful for operations in a BPO (Business Processes Outsourcing) unit? What factors may be important for this Industry? Discuss. [6]

(b) Historical demand for a product is -

[10]

Demand	
Jan	12
Feb	11
March	15
April	12
May	16
June	15

- Using a weighted moving average with weights of 0.60, 0.30 and 0.10, find the July forecast.
- Using a simple three month moving average, find the July forecast.
- Using single exponential smoothing with  $\alpha = 0.2$  and a June forecast =13, find the July forecast. Make whatever assumptions you wish to.
- Using simple linear regression analysis, calculate the regression equation for the preceding demand data.

## UNIT- II

Q.2 (a) Explain the various types of production system with suitable examples. [8]

(b) Sailmaster makes high performance sails for competitive wind surfers. Below is information about the input and output for one model, the windy 2000 - [8]

<u>Units Sold</u>	<u>1217</u>
Sales price each	₹ 102000/-
Total labour hours	46672
Wage Rate	₹ 720/hour
Total materials	₹ $36 \times 10^5$
Total Energy	₹ 240000

Calculate the productivity in sales revenue/labour expense.

**OR**

Q.2 (a) What is the concept of "division of labour"? How is it applied to the assembly lines? Give at least two real life examples. [8]

(b) Two types of cars (Deluxe & Limited) were produced by a car manufacturer in 2018. Quantities sold, price per unit and labour hours are as follows - [8]

Type	Quantity	₹ / unit
Deluxe car	4000 units sold	480000/-
Limited car	6000 units sold	570000/-
Labour (Deluxe)	20,000 hours	₹ 720 / hour
Labour (Limited)	30,000 hours	₹ 840 / hour

What is the labour productivity for each car? Explain the problem(s) associated with the labour productivity.

**UNIT- III**

Q.3 (a) Describe various factors that should be considered for the selection of a plant location. [8]

(b) Rao Electronics assembles pocket calculators at Delhi and Chennai and can draw raw materials from Hyderabad, Goa and Bangalore. The company wants to set up another plant at either Bhopal or Indore. Other details are given in the table below - [8]

Raw Material Source	Cost per unit at Destination (₹)				Source Capacity
	Delhi	Chennai	Bhopal	Indore	
Hyderabad	60	90	100	120	10000
Goa	90	80	70	80	10000
Bangalore	110	90	70	90	10000
Requirement	6000	5500	5500	5500	

Find out –

- Which location will minimize raw material cost?
- How much these cost will be for two cities?

**OR**

- Q.3 (a) What are the three classical types of layout? Give an example of each. [8]
- (b) A bill of material is desired for a bracket (z 100) that is made up of a basis (A 10), two springs (B 11) and four clamps (C 20). The base is assembled from one clamp (C 20) and two housings (D 21). Each clamp has one handle (E 30) and each housing has two bearings (F 31) and one shaft (G 32). [8]
- (i) Design a product structure tree that includes the level coding information.
- (ii) Show the data in the form of an indented bill of material.

**UNIT- IV**

- Q.4 (a) What are production planning and production control functions? Explain with industry based examples. [8]
- (b) Consider the following 3 machines and 5 jobs flow shop problem - [8]

<u>Processing Time</u>			
job	m/c 1	m/c 2	m/c 3
1	8	5	4
2	10	6	9
3	6	2	8
4	7	3	6
5	11	4	5

- (i) Find the optimal sequence of processing.
- (ii) Also find its make span for optimal sequence.

**OR**

- Q.4 (a) Compare the production control techniques in Job shop production, batch production and mass production systems. [8]
- (b) Discuss in the light of manufacturing philosophy, prerequisite and elements for the following - [8]
- (i) JIT Manufacturing
- (ii) LEAN Manufacturing

## UNIT- V

Q.5 (a) What are the various elements of SCM and what is Bullwhip effect? [6]

(b) Drasco is a medium-size manufacturer of oil field pumps. The firm has developed a new model of its high-pressure, secondary-recovery purge pump with improved performance. Bonnie Nelsan, Manager of process engineering is trying to decide whether Drasco should make or buy the electronically controlled input valve for the new pump. Her engineers have developed the following estimates- [10]

	Make (Process A)	Make (Process B)	Buy
Annual volume	10,000 units	10,000 units	10,000 units
Fixed cost/year	\$ 100,000	\$ 300,000	-
Variable cost/year	\$ 75	\$ 70	\$ 80

- (i) Should Drasco make the valve using Process A or Process B or Buy?
- (ii) At what annual volume should Drasco switch from buying to make the valve using process A?
- (iii) At what annual volume should Drasco switch from Process A to Process B?

### OR

Q.5 (a) Differentiate in detail between CPM & PERT. [4]

(b) List of activities for erecting a canteen in a factory is given below with other relevant details. Job A must precede all others, while Job E must follow others. Apart from this, jobs can run concurrently - [12]

Code	Job Description	Normal		Crash	
		Duration (days)	Cost (₹)	Duration (days)	Cost (₹)
A	Lay foundation & Build walls	5	3000	4	4000
B	Tile roofing	6	1200	2	2000
C	Install electricity	4	1000	3	1800
D	Install plumbing	5	1200	3	2000
E	Connect services to finish	3	1600	3	1600

- (i) Draw the network and identify the critical path.
- (ii) Crash the network fully to find out minimum duration.
- (iii) If indirect costs are ₹ 300 per day, determine time - cost trade off for the project.

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7E7018

Roll No. \_\_\_\_\_

Total No of Pages: 3

**7E7018**

**B. Tech. VII - Sem. (Back) Exam., Feb.-March - 2021**

**Mechanical Engineering**

**7ME6.3A CNC Machines and Programming**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 48**

**Min. Marks: 15**

*Instructions to Candidates:*

*Attempt **three** questions, selecting **one** question each from any three unit. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No.205)*

1. NIL

2. NIL

### **UNIT- I**

Q.1 (a) What are the basic components of NC system? Explain each component in detail and draw figures wherever possible. [8]

(b) Compare NC machines with conventional machines and write down advantages of NC machines over conventional machines. [8]

**OR**

Q.1 (a) Give arguments in favour (Advantages) and against the automation. [8]

(b) Identify four situations in which manual labor is preferred over automation. Compare hard automation and soft automation. [8]

## UNIT- II

- Q.2 (a) Explain the essentials for work holders on NC machines. [8]
- (b) How many types of drives can be used in NC system? Explain. Also write down about spindle and feed drive used in NC machines. [8]

OR

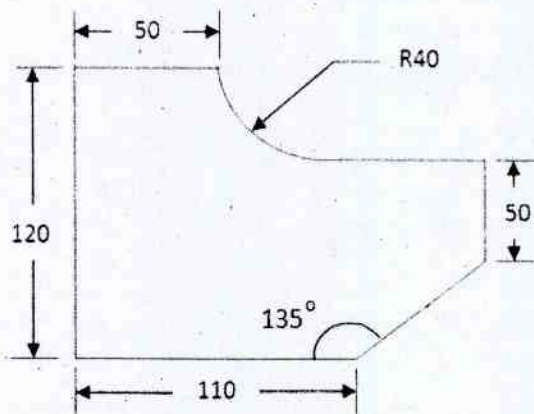
- Q.2 (a) What are the design criteria to be used in designing NC machine tools? [8]
- (b) Define Sensors and their applications in Numerical control machines. Also write down various types of sensors. [8]

## UNIT- III

- Q.3 (a) What do you understand by “canned cycle” in manual part programming? Explain with neat sketches the differences between the operations of the canned cycles G81 and G83. [12]
- (b) What do mean by dwell? How is it written in part program? Explain its functions. [4]

OR

- Q.3 Write a complete computer aided part program for the following component shown in the figure using an end mill cutter of 20 mm diameter. Clearly show the axes system chosen, with a sketch and direction of the cutter for the motion statements. [16]



All dimensions in mm

## UNIT- IV

Q.4 What are the differences between retrieval and generative type of computer-aided process planning? Which is better? Explain your answer. Also mention salient features of variant type of CAPP system. [16]

OR

Q.4 Describe NC simulation. What do you understand by Kinematic simulation and volumetric simulation? Also mention applications of Volumetric NC Simulation. [16]

## UNIT- V

Q.5 Under what conditions, an adaptive control is recommended in CNC machines? Discuss various types of adaptive control with the help of suitable examples. [16]

OR

Q.5 Write short notes on the following -

- (a) Die Sinking [4]
  - (b) Rapid product development [4]
  - (c) Flexible Manufacturing System [4]
  - (d) Computer Integrated Manufacturing [4]
-

7E7017

Roll No. \_\_\_\_\_

Total No of Pages: 2

**7E7017**

**B. Tech. VII - Sem. (Back) Exam., Feb.-March - 2021**  
**Mechanical Engineering**  
**7ME6.2A Robotics**  
**ME, PI**

**Time: 2 Hours**

**Maximum Marks: 48**  
**Min. Passing Marks: 15**

*Instructions to Candidates:*

*Attempt **three** questions, selecting **one** question each from any three unit. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL \_\_\_\_\_

2. NIL \_\_\_\_\_

### **UNIT- I**

- Q.1 (a) Explain laws of robotics and requirements of robots in daily life. [8]  
(b) What is progressive advancement in robotics? [8]

**OR**

- Q.1 (a) Write a short note on “applicability of sensors and vision in robotics”. [8]  
(b) What are the future prospectus of robots? [8]

### **UNIT- II**

- Q.2 (a) What are Grippers? How are these helpful in robotics? [8]  
(b) Differentiate between active and passive grippers. [8]

**OR**

- Q.2 (a) What do you mean by Transform? Explain the inverting homogeneous transform. [8]  
(b) What is process of describing an object in space? [8]

### **UNIT- III**

- Q.3 (a) Explain the co-operation and interaction between human and humanoid robots. [8]
- (b) Write a short note on Inverse Kinematic Model. [8]

#### **OR**

- Q.3 (a) What are the Links and Joints? Explain with usages and advantages. [8]
- (b) Explain Denavit-Hartenberg notation with neat sketches. [8]

### **UNIT- IV**

- Q.4 (a) What is Image Acquisition? How can an image be represented in a digital form? Explain. [8]
- (b) What are the criteria to choose the best sensor for a particular robot? [8]

#### **OR**

- Q.4 (a) Explain various sensors used in robotics. Explain one sensor in detail. [8]
- (b) Write a short note on "Robotic vision". [8]

### **UNIT- V**

- Q.5 (a) How can a robot be programmed? Explain with example. [8]
- (b) Explain robot applications in Industries. [8]

#### **OR**

- Q.5 Write short notes on-
- (a) Robot safety [5]
- (b) Robot programming [5]
- (c) VAL system [6]
-

**7E7011**

Roll No. \_\_\_\_\_

Total No of Pages: **4****7E7011****B. Tech. VII - Sem. (Back) Exam., Feb.-March - 2021****Mechanical Engineering****7ME1A Finite Element Methods****Common for ME, PI****Time: 2 Hours****[To be converted as per scheme]****Max. Marks: 48****Min. Marks: 15***Instructions to Candidates:*

Attempt **three** questions, selecting **one** question each from any three unit. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.  
(Mentioned in form No.205)

1. NIL2. NIL**UNIT-I**

Q.1 (a) Discuss in detail the difference between local stiffness matrix and global stiffness matrix with suitable example. [8]

(b) Solve the system of equations by Gauss elimination method - [8]

$$X_1 + X_2 + X_3 = 6$$

$$3X_1 + 3X_2 + 4X_3 = 20$$

$$2X_1 + X_2 + 3X_3 = 13$$

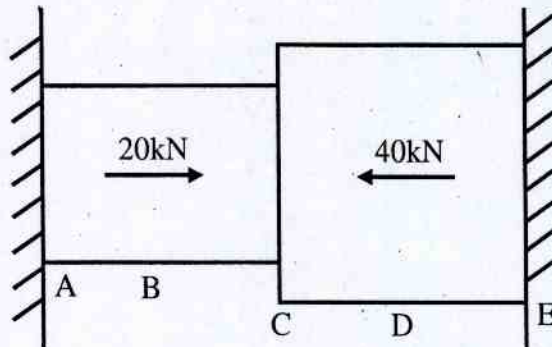
**OR**

Q.1 (a) Explain uniqueness of solution with suitable example. [6]

(b) Derive global stiffness matrix for two spring system using local stiffness matrix for each element. [10]

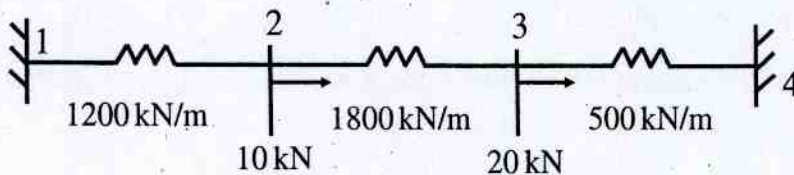
## UNIT- II

- Q.2 (a) State and explain the principle of minimum potential energy. [4]
- (b) A bar of length 1000 mm is made of brass and aluminium and is subjected to loads as shown in figure. AC is made of brass. Its length is 500 mm with area  $1000 \text{ mm}^2$  and modulus of elasticity is 105 GPa. CE is made of aluminium. Its length is 500 mm, area  $2000 \text{ mm}^2$  and modulus of elasticity is 70 GPa. The loads are applied of AC and CE. Determine the following - [12]
- (i) Nodal displacements
  - (ii) Stress in each element
  - (iii) Reaction forces



OR

- Q.2 (a) Derive the shape function of a quadratic 1-D bar element using polynomial form in local coordinates. [6]
- (b) 3 springs assembled collinear as shown in figure. Nodes 1 and 4 are fixed and axial loads of 10 kN and 20 kN are applied at nodes 2 & 3 respectively. Determine the displacements at node 2 and 3. [10]



### UNIT- III

- Q.3 (a) What is isometric formulation? Define it for 1D bar elements. [6]
- (b) Consider the truss element with the coordinates 1 (10, 10) and 2 (50, 40). If the displacement vector is  $q = [15, 10, 21, 43]^T$  mm, then determine : [10]
- (i) The Vector 'q'
- (ii) Stress in the element and
- (iii) Stiffness matrix if  $E = 70$  GPa and  $A = 200$  mm<sup>2</sup>

### OR

- Q.3 (a) Formulate the shape function for the Constant Strain for simple 3 noded triangular element using polynomial functions. [8]
- (b) Evaluate the integral by Gaussian quadrature formula. [8]

$$I = \int_{-1}^{+1} (2 + x + x^2) dx$$

### UNIT- IV

- Q.4 (a) Write short note on Rayleigh – Ritz method. [4]
- (b) Use Galerkin's method of weighted residuals to obtain an approximate solution of differential equation  $\frac{d^2y}{dx^2} - 10x^2 = 5$ ,  $0 \leq x \leq 1$  with boundary conditions  $y(0) = y(1) = 0$  [12]

### OR

- Q.4 The thermal conductivity of a steel rod of 0.1 m length and area of cross section of 1 cm<sup>2</sup> is 20 W/m°C. The rate of heat generation in the rod is 10<sup>5</sup> W/m<sup>3</sup>. One end of the rod is kept at 0°C and at the other end at 100°C. The rod is insulated everywhere except at the ends. Using finite element method with 2 bar elements, find the temperature at the mid-point of the rod. Also find out the heat flow at the ends of the rod using FEM. [16]

## UNIT- V

- Q.5 (a) What is Mesh Refinement? Explain. [6]
- (b) Find the value of  $f(5)$  from the following table by using Lagrange's interpolation formula. [10]

x	1	2	3	4	7
f(x)	2	4	8	16	128

OR

- Q.5 (a) Write short notes on - [6]
- (i) Effect of element aspect ratio on accuracy
  - (ii) Static condensation
- (b) Explain the concept of element mass matrix in dynamic analysis. [10]
-

7E1708

Roll No. \_\_\_\_\_

Total No. of Pages: 2

**7E1708**

**B. Tech. VII - Sem. (Main) Exam., Feb.- March - 2021**  
**OE – I Open Elective-I Aeronautical Engineering**  
**7AN6 – 60.2 Non-Destructive Testing**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 82**

**Min. Marks: 29**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 List any four limitations of non-destructive tests.
- Q.2 Write the physical principle of liquid penetrant test.
- Q.3 Draw any two eddy current testing probes.
- Q.4 Define the term “Emissivity”.
- Q.5 What are surface discontinuities?
- Q.6 What are the applications of angle beam for ultrasonic testing?
- Q.7 What is the function of Image Quality Indicator (IQI)?

- Q.8 How echoes of A – scan will be displayed?
- Q.9 Mention the types that can be detected by magnetic particle testing.
- Q.10 What is film ionization?

### **PART – B**

**(Analytical/Problem solving questions)**

**[4×8=32]**

**Attempt any four questions**

- Q.1 Explain the contact and non-contact inspection.
- Q.2 Explain ultrasonic testing with the help of a neat sketch.
- Q.3 Explain Eddy current testing with the help of a neat sketch.
- Q.4 Explain magnetic particle testing with the help of a neat sketch.
- Q.5 Explain the instrumentation of acoustic emission.
- Q.6 Briefly describe the principles of thermograph and its application.
- Q.7 Briefly discuss the techniques of radiographic inspection with their applications.

### **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[2×15=30]**

**Attempt any two questions**

- Q.1 Discuss the different optical sides used for Visual Inspection.
- Q.2 With the help of a block diagram, explain the post emulsifiable liquid penetrant method.
- Q.3 List the various welding defects and discuss the suitable NDT technique for its detection and quantification.
- Q.4 Explain various stages that are necessary to ensure the detection of fatigue crack of a steam turbine blade by magnetic particle testing.
- Q.5 Explain how the various casting defects are detected by radiography technique.
-

7E1710

Roll No. \_\_\_\_\_

Total No. of Pages: **2**

**7E1710**

**B. Tech. VII - Sem. (Main) Exam., Feb.-March - 2021**

**OE-I Open Elective-I**

**7AG6-60.1 Human Engineering and Safety**

**Time: 2 Hours**

**[To be converted as per scheme]**

**Max. Marks: 82**

**Min. Marks: 29**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

**PART – A**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 What are examples of human factors?
- Q.2 What are the main functions of the skeletal systems?
- Q.3 Differentiate between static and dynamic works.
- Q.4 What is an audio warning cue?
- Q.5 How do we measure sound waves?
- Q.6 What do you understand by Workmen compensation?
- Q.7 What do you understand by visual displays?
- Q.8 What do you understand by factual display?
- Q.9 What are the uses of display?
- Q.10 What do you understand by auditory displays?

## **PART – B**

**(Analytical/Problem solving questions)**

**[4×8=32]**

**Attempt any four questions**

- Q.1 Discuss the design of workspace for standing and seated workers.
- Q.2 What are the types of muscle fatigue? Explain the factors influencing the work posture.
- Q.3 How do you calculate the rest periods in manual work?
- Q.4. What is the significance of vision measures taken for the protection of the vision?
- Q.5 What are some good color combinations? Write the guide lines for using colour combinations.
- Q.6 Explain the damages due to noise. What are the preventive measures are taken?
- Q.7 How do you calculate the rest periods in manual work?

## **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[2×15=30]**

**Attempt any two questions**

- Q.1 Write short note on -
    - (a) Concept of visibility
    - (b) Location of controls in work place
  - Q.2 Explain effect of following conditions on energy expenditure -
    - (a) Extreme heat
    - (b) Extreme cold
    - (c) High humidity
  - Q.3 What are the characteristics of system design? How human factors are applied in system design?
  - Q.4 Explain the physiological effects of heat & cold. Explain its remedies.
  - Q.5 Narrate the compatibility relationships in display and controls.
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