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7E1747

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B.Tech. VII Sem. (Main/Back) Examination, January - 2023

Mechanical Engg.

7ME5-11 : I.C. Engines

Time : 3 Hours

Maximum Marks : 120

Min. Passing Marks : 42

**Instructions to Candidates:**

*Attempt all Ten questions From Part A, Five Questions out of Seven from Part B and Four questions out of Five from Part C .*

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

**PART - A**

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

**All questions are compulsory.**

**(10×2=20)**

1. Write the desirable qualities for S.I. engine fuel?
2. What are the stages of combustion in a S.I. Engines?
3. List down the air-fuel ratio requirements of a S.I. Engines.
4. Write the different types of combustion chamber in S.I Engine.
5. Why a S.I. engine requires a rich mixture during Idling and at full load?
6. What is abnormal combustion in C.I. engine?
7. What are the causes for hydrocarbon emission from S.I. engines?
8. What are the different types of lubrication system?
9. What are the main disadvantages of the stratified charge engine?
10. What are the types of injection systems?

## PART - B

(Analytical/Problem solving questions)

Attempt any Five questions:

(5×8=40)

1. What are the fundamental differences between SI and CI engines?
2. What are the desirable properties of I.C. Engine fuel?
3. Describe how the I.P. of a multi cylinder engine is measured? Mention the assumption made.
4. Describe knocking phenomenon in C.I. engine.
5. Explain the working of an electronic ignition system in S.I. engine giving a neat sketch.
6. Explain the working of a two stroke, naturally aspirated S.I. engine giving neat sketch.
7. Enumerate lubrication system and explain wet sump lubrication system with the help of a neat sketch.

## PART - C

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

Attempt any Four questions.

(4×15=60)

1. Explain why rich or lean mixtures are supplied during Idling, Normal running and Maximum power range in a S.I. engine? Give the values of Air fuel ratios.
2. Write in detail to explain the 5 efficiencies which indicates the performance of an engine. What are their general values?
3. The following data was recorded during testing of a two stroke gas engine:-

Diameter of the piston

$$d = 150 \text{ mm}$$

Stroke length

$$L = 180 \text{ mm}$$

Clearance volume

$$V_c = 0.89 \text{ litre}$$

RPM of the engine

$$N = 300$$

Indicated mean effective pr.

$$p_m = 6.1 \text{ bars}$$

Gas consumption

$$m = 6.1 \text{ m}^3 / \text{G}$$

Calorific value of the gas (fuel)

$$CF = 17000 \text{ kg} / \text{m}^3$$

Determine the followings:-

- i) Air standard efficiency.
- ii) Indicated power (IHP) developed by the engine.

- 69
- iii) Indicated thermal efficiency of the engine.
4. Explain the working of stratified charge and Rotary engine.
5. Explain the suitability of a diesel engine to run on dual fuel engine. Why the preferred fuel for a diesel engine is natural gas?
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**7E1748**

**B.Tech. VII Sem. (Main/Back) Examination, January - 2023**  
**Mechanical Engg.**  
**7ME5-12 Operations Research**

**Time : 3 Hours****Maximum Marks : 120****Min. Passing Marks : 42****Instructions to Candidates:**

*Attempt all Ten questions From Part A, Five Questions out of seven from Part B and Four questions out of Five from Part C .*

*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)*

**PART - A**

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

**ALL questions are compulsory.**

**(10×2=20)**

1. Write the classification of OR models.
2. Explain the use of vogel's approximate method.
3. What are the limitation of LP Problems?
4. What is meant by Monte Carlo Simulation?
5. Give some important application of queuing theory in industries.
6. Distinguish between mathematical models and simulation models.
7. What is rectangular game?
8. What is dynamic programming?
9. What is meant by Optimality test in a transportation problem.
10. Explain the mathematical formulation of an assignment problem.

## PART - B

### (Analytical/Problem solving questions)

Attempt any five questions.

(5×8=40)

1. Explain deterministic and stochastic inventory models. (8)
2. The Pay off matrix of a game is given. Find the solution of the game to the player A and B.

		Player B				
Player A		I	II	III	IV	V
	I	-2	0	0	5	3
	II	3	2	1	2	2
	III	-4	-3	0	-2	6
	IV	5	3	-4	2	-6

(8)

3. Explain various methods for generation of random numbers with example. (8)
4. Write a short note on decision trees. (8)
5. Solve the following transportation problem by
  - i) Minimum cost method
  - ii) NWC method

state which of the methods is better.

Cell entries represent the unit transportation cost.

	D1	D2	D3	D4	Availability
S1	21	16	25	13	11
S2	17	18	14	23	13
S3	32	27	18	41	19
Requirement	6	10	12	15	

(8)

6. What is degeneracy? How do you overcome degeneracy in transportation problems? (8)
7. Explain the principle features of simulation languages. (8)

## PART - C

(Descriptive/Analytical/Problem solving/Design Questions)

Attempt any four questions.

(4×15=60)

1. What do you mean by LPP? Use penalty (or Big-M) method to maximize

$$Z = 3x_1 - x_2$$

Subjected to the constraints

$$2x_1 + x_2 \geq 2; x_1 + 3x_2 \leq 3; x_2 \leq 4; x_1, x_2 \geq 0 \quad (15)$$

2. Consider the problem of assigning five operators to five machines. The assignment cost are given in below table.

	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	M <sub>4</sub>	M <sub>5</sub>
A	7	7	-	4	8
B	9	6	4	5	6
C	11	5	7	-	5
D	9	4	8	9	4
E	8	7	9	11	11

Operator A cannot be assigned to machine M<sub>3</sub> and operator C cannot assigned to machine M<sub>4</sub>. Find optimum assignment schedule. (15)

3. Solve the following integer linear programming using Gomory's cutting plane method.

$$\text{Max } Z = 2x_1 + 3x_2$$

Subjected to  $2x_1 + 2x_2 \leq 7$  (15)

$$x_1 \leq 2; x_2 \leq 2$$

$x_1, x_2 \geq 0$  and integers

4. Ships arrive at a port at the rate of one in every 4 hours with exponential distribution of inter arrival times. The time a ship occupies a berth for unloading has exponential distribution with an average of 10 hours. If the average delay of ships waiting for berth is to be kept below 14 hours, How many berths should be provided at the port.? (15)

5. a) Derive the mathematical equation for EOQ. What are the assumptions involved? (8)
- b) Explain the theory of dominance in the solution of rectangular games. (7)

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**B.Tech. VII Sem. (Main/Back) Examination, January- 2023**  
**Mechanical Engg.**  
**7ME5-13 Turbomachines**

**Time : 3 Hours**

**Maximum Marks : 120**

**Min. Passing Marks : 42**

**Instructions to Candidates:**

*Attempt all Ten questions From Part A, Five Questions out of seven from Part B and Four questions out of five from Part C .*

*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)*

**PART - A**

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

**All questions are compulsory.**

**(10×2=20)**

1. Define turbo machinery.
2. Write down the Euler's turbine equation.
3. Write down the first and second law of thermodynamics applied to turbo machines.
4. Write the range of specific speeds of various turbo machines.
5. Explain the phenomena of surging.
6. What is the advantages of axial flow compressors?
7. What is the working principle of Reciprocating compressor?
8. Explain slip and slip factor for centrifugal pump.
9. Explain cavitation for axial flow pumps.
10. Explain the air vessels for reciprocating pumps.

**PART - B**

**(Analytical/Problem solving questions)**

**Attempt any Five questions**

**(5×8=40)**

1. Classify turbo machinery. Derive the Euler's expression for turbo machinery.
2. The efficiency of turbomachine depends on density ( $\rho$ ), dynamic viscosity ( $\mu$ ) of the fluid, angular velocity ( $w$ ), diameter ( $D$ ) of the rotor and the discharge ( $Q$ ). Express efficiency ( $\eta$ ) in terms of the dimensionless parameters.

3. What is similitude? What are the different types of similarities between the model and its prototype?
4. Derive the expression for pressure rise in the centrifugal pump.
5. Explain the working principle of centrifugal compressor with neat sketch.
6. What is meant by a stage and explain in detail the stage velocity triangles of axial flow compressor.
7. Classify the Reciprocating pump with components and explain the working principle of Reciprocating pump.

### **PART - C**

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

**Attempt any Four questions.**

**(4×15=60)**

1. Explain the following:-
    - a) Methods of preventing cavitation
    - b) Axial pump characteristics.
  2. Explain the following:-
    - a) Indicator diagram of Reciprocating pump.
    - b) Effect of friction and acceleration on Reciprocating pump.
  3. Explain the following:-
    - a) Derive an expression for the minimum speed of starting a centrifugal pump.
    - b) Performance curve for centrifugal pump.
  4. Explain the following :-
    - a) Cascade test of axial flow compressor.
    - b) Compressibility effects on axial flow compressor.
    - c) Operating characteristics of axial flow compressor.
  5. Explain the following:-
    - a) Combined velocity diagram for 50% reaction and maximum utilization for a turbine.
    - b) Centrifugal compressor characteristic.
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**7E1751**

**B.Tech. VII - Sem. (Main/Back) Examination, January - 2023**  
**Open Elective-I**  
**7ME6-60.2 : Quality Management**

**Time : 3 Hours****Maximum Marks : 120**  
**Min. Passing Marks : 42****Instructions to Candidates:**

Attempt **All Ten** questions from **Part A**. Five questions out of seven from **Part B** and **Four** questions out of five from **Part C**.

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)

**PART - A**

(Answer should be given up to 25 words only)

(10×2=20)

**ALL questions are compulsory.**

1. Who emphasized that 'quality is free'.

- A. Juran
- B. Crosby
- C. Taguchi
- D. Deming

2. Match the two parts correctly.

A	Quality is conformance to requirements	i)	Philip B. Crosby
B	Control charts	ii)	Ishikawa
C	Quality Circle	iii)	Joseph Juran
D	Quality is fitness for use	iv)	Shewhart

3. The Japanese call 'Error proofing' as \_\_\_\_\_ and 'Continuous improvement' as \_\_\_\_\_.

4. In Deming cycle PDCA stand for \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

5. Which of the followings is not a component of Juran's quality trilogy?

- A. Quality audit
- B. Quality planning
- C. Quality improvement
- D. Quality control

6. Two other names of 'cause-and-effect diagram' are \_\_\_\_\_ and \_\_\_\_\_.
7. Which tool is used for recording of data?
- A. Scatter diagram
  - B. Histogram
  - C. Check sheets
  - D. Pareto chart
8. 5S stands for (in sequence) \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.
9. Benchmarking determines
- A. Process capability
  - B. Getting ISO 9000 audit done
  - C. How company is doing relative to others
  - D. When to investigate the process
10. Which of the following is not an element of a TQM system?
- A. Detention
  - B. Measurement
  - C. Leadership
  - D. Communication

### **PART - B**

#### **(Analytical/Problem Solving Questions)**

**Attempt any Five questions.**

**(5×8=40)**

1. What is cost of quality? Explain major quality costs with suitable examples.
2. Differentiate between quality of design and quality of conformance.
3. Differentiate between quality control and quality assurance.
4. Draw a cause-and-effect diagram detailing reasons why university students might be dissatisfied.
5. Describe JIT manufacturing in connection with quality management.
6. What is process failure mode and effect analysis? Provide a simple example illustrating the concept.
7. What is robust design? Explain why it is important for both consumers and manufacturers.

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**PART - C**

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

**Attempt any Fou questions.**

**(4×15=60)**

1. Describe the TQM's house. Write a plan to implement TQM in a university.
2. Explain the Taguchi loss function and how it is used in process and tolerance design.
3. What are lean-and six sigma philosophies? Describe their role in process quality improvement.
4. What is an operating characteristic (OC) curve? Discuss the impact of change in sampling parameters such as lot size, sample size and acceptance number on the discriminating power of an OC curve.
5. A simple bathtub-shaped hazard rate function is given by

$$h(t) = 10 - 3t + 0.4t^2 \quad t \geq 0$$

Find failure density, failure distribution and reliability functions. Also, sketch these four functions.

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	<b>7E1750</b>	
	<b>B.Tech. VII - Sem. (Main/Back) Examination, January - 2023</b> <b>Open Elective - I</b> <b>7ME6-60.1 : Finite Element Analysis</b>	

**Time : 3 Hours**

**Maximum Marks : 120**

**Min. Passing Marks : 42**

**Instructions to Candidates:**

*Attempt all Ten questions from Part A, Five questions out of Seven from Part B and Four questions out of Five from Part C.*

*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)*

**PART - A**

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

**All questions are compulsory.**

**(10×2=20)**

1. Write down objectives of FEA.
2. List down FEA software.
3. What is Banded symmetric matrix?
4. What are properties of stiffness matrix?
5. What is shape function?
6. What is tensor?
7. What is strain?
8. What is node numbering?
9. What is meshing?
10. What is static condensation?

**PART - B**

**(Analytical/Problem solving questions)**

**Attempt any Five questions.**

**(5×8=40)**

1. Discuss FEA discretization.
2. Describe general procedure to solve Finite Element Method problem.
3. Explain stress and strain tensor, support with neat diagram.
4. Explain Constant Strain Triangle (CST). Also formulate its shape function.
5. Explain one dimensional heat transfer for a bar element in detail.

6. Define various boundary conditions used in FEA.
7. Give the applications and advantages of FEA.

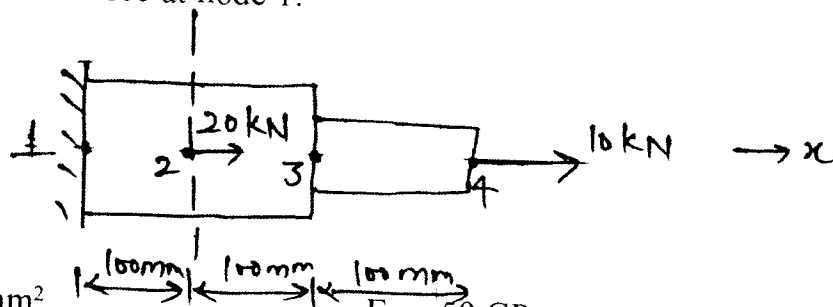
### PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Four questions.

(4×15=60)

1. Derive Global stiffness matrix for a three spring system using local stiffness matrix for each element.
2. Using MPE approach for the given system, calculate -
  - i. Displacement at node 2,3 and 4.
  - ii. Reaction force at node 1.



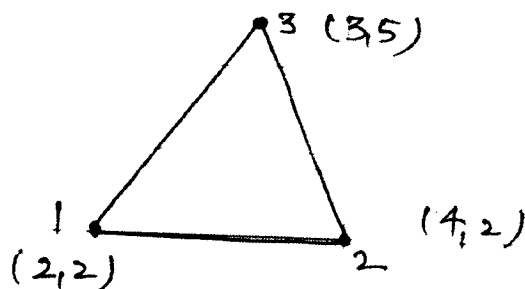
$$A_1 = 20 \text{ mm}^2$$

$$A_2 = 10 \text{ mm}^2$$

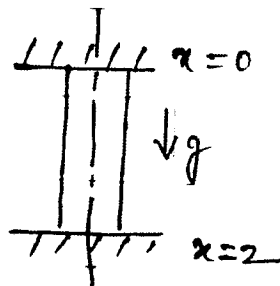
$$E_1 = 50 \text{ GPa}$$

$$E_2 = 100 \text{ GPa}$$

3. Calculate the shape function matrix  $[N]$  at node 1,2,3 and also at the centroid of the triangle -



4. Using Rayleigh - Ritz method, find the displacement of the mid - point of the rod as shown in figure -



Body force per unit volume,  $fg = 1$ ,  $E = A = 1$ .

5. Discuss.
  - i. Convergence and Aspect ratio.
  - ii. Methods of Mesh refinement.

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7E7011	Roll No. _____	[Total No. of Pages : 3]
	<b>7E7011</b>	
	<b>B.Tech. VII-Sem. (Back) Examination, January - 2023</b> <b>Mechanical Engineering</b> <b>7ME1A : Finite Element Methods</b> <b>ME, PI</b>	

Time : 3 Hours Maximum Marks : 80  
Min. Passing Marks : 26

**Instructions to Candidates:**

Attempt any five questions. Selecting **one** question from **each** 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.)

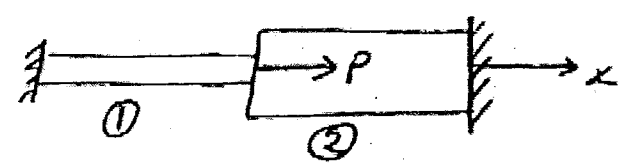
Use of following supporting material is permitted during examination. (Mentioned in form No.205)

**UNIT - I**

1. a) Solve the following Equations using Gauss Elimination

method  $a + 2b + 3c + 4d = 10$  (8)  
 $7a + 10b + 5c + 2d = 40$   
 $13a + 6b + 2c - 3d = 34$   
 $11a + 14b + 8c - d = 64$

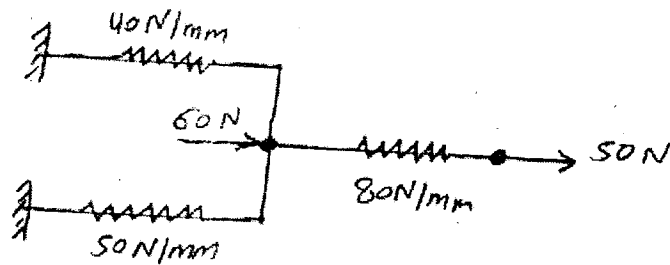
- b) Find the nodal displacement and stress in each material of given system for applied load  $P = 10kN$  (8)



Element 1) Made by aluminium -  $E_{Al} = 70GPa$ ,  $A_1 = 900 \text{ mm}^2$ ,  $L_1 = 200 \text{ mm}$ .  
 Element 2) Made by steel -  $E_s = 200 \text{ GPa}$ ,  $A_2 = 1200 \text{ mm}^2$ ,  $L_2 = 300 \text{ mm}$ .

**(OR)**

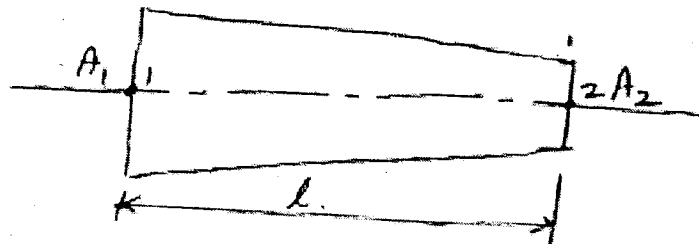
1. a) Define the terms :  
 i) Uniqueness of solution  
 ii) Banded Matrix. (3+3)  
 b) Determine the displacement of nodes of the spring system shown in Fig. (10)



## UNIT - II

2. a) Explain the terms node and mesh. Also explain node numbering and its significance. (6)
  - b) Using the minimum potential energy approach, obtain the general expression of elemental stiffness matrix and verified it for 1-D linear Element. (10)
- (OR)

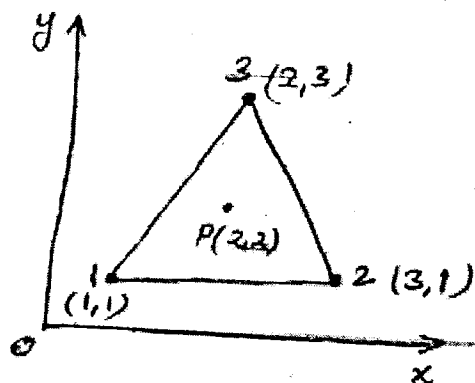
2. a) Consider a bar element whose area of cross-section varies linearly along the longitudinal axis as in Fig. Drive its stiffness matrix. How will this compare with the stiffness matrix obtained assuming that the bar is of uniform cross section area equal to that of its mid length. (12)



- b) Explain the general steps of FEM. (4)

## UNIT - III

3. a) Derive the expression for the stiffness matrix for a triangular element.
- b) For a triangular element as shown in fig., the nodal values of displacement are given. Obtain the displacement of point (2,2) with in the element.



$$u_1 = 2.0; u_2 = 3.0; u_3 = 5.0$$

$$v_1 = 1.0; v_2 = 2.0; v_3 = 3.0$$

(OR)

3. a) Explain the plain stress and plain strain conditions. (6)
- b) Evaluate using Gauss quadrature formula.

$$I = \int_{-1}^1 (2 + x + x^2) dx \quad (10)$$

#### UNIT - IV

4. a) Consider the following boundary value problem:

$$\frac{d^2 u}{dx^2} + u = 1; 0 \leq x \leq 1 \text{ with } u(0) = 0 \text{ and } \frac{du}{dx} = 0 \text{ at } x = 1$$

Solve this equation using Galerkin method. (8)

- b) Derive 1D heat transfer equation with uniformly distributed heat source using functional. (8)

(OR)

4. a) A problem of one dimensional heat transfer is governed by the equation

$$\frac{d^2 \phi}{dx^2} + \phi + 1 = 0 \text{ and boundary conditions } \phi = 1 \text{ at } x = 0 \text{ and } \frac{d\phi}{dx} = 1 \text{ at } x = 1 \text{ use Ritz}$$

method to solve this problem. Approximate the function by a quadratic polynomial and compare with exact solution. (10)

- b) Write a short note on :

- i) Point collocation method
- ii) Subdomain method
- iii) Least square method.

(3×2=6)

#### UNIT - V

5. a) What do you mean by consistent and lumped mass matrix? Derive the same for linear bar element. (8)

- b) Calculate the shape functions of 1D quadratic element using lagrange interpolation method. (8)

(OR)

5. a) Write a short note on

- i) Continuity and compatibility.
- ii) Convergence
- iii) Static condensation.
- iv) Mesh refinement.

(4×3=12)

- b) Discuss the application and advantages of FEM. (4)



**7E7012**

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

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**7E7012**

**B.Tech. VII - Sem. (Back) Examination, January - 2023**  
**Mechanical Engineering**  
**7ME2A : Refrigeration and Air-Conditioning**

**Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 26****Instructions to Candidates:**

*Attempt any **five** questions, selecting **one** question from **each** 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)*

**UNIT - I**

1. Explain the effects of the following on the performance of vapour compression refrigeration system with the help of T-s and P-h diagrams.
  - a) Decrease in evaporator pressure
  - b) Increase in condenser pressure

**(8+8)****(OR)**

1. Explain two stage cascade refrigeration system with schematic, pressure-enthalpy and temperature-entropy diagrams.

**(16)****UNIT - II**

2.
  - a) What are the limitations of Carnot refrigeration cycle with gaseous refrigerants?
  - b) Explain Boot-strap air cooling system with schematic and T-s diagram.

**(8+8)****(OR)**

2. In a refrigeration plant working on Bell Coleman cycle, air is compressed to 5 bar from 1 bar. Its initial temperature is 10°C. After compression, the air is cooled up to 20°C in a cooler before expanding back to a pressure of 1 bar. Determine the theoretical COP of the plant and net refrigerating effect.

**(16)**

### UNIT - III

3. Explain three-fluid system of refrigeration (Electrolux refrigeration system) and explain its working with suitable diagram. (16)

(OR)

3. Draw a neat diagram of lithium bromide water absorption system and explain its working. (16)

### UNIT - IV

4. The atmospheric air at  $30^{\circ}\text{C}$  dry bulb temperature and 75% relative humidity enters a cooling coil at the rate of  $200\text{ m}^3/\text{min}$ . The coil dew point temperature is  $14^{\circ}\text{C}$  and the bypass factor of the coil is 0.1. Determine:

- The temperature of air leaving the cooling coil
- The capacity of cooling coil in tones of refrigeration
- The amount of water vapour removed per minute; and
- The sensible heat factor for the process.

(16)

(OR)

4. a) How the cooling load estimated for a closed space? What are different factors considered in cooling and heating load estimation for comfort condition?  
b) Explain the 'Effective Temperature' and elaborate its importance in the designing of air conditioning systems. (8+8)

### UNIT - V

5. a) Explain with neat sketch the working of Summer air conditioning system. How it is different than year round air conditioning system?  
b) What are the differences in the industrial and comfort air conditioning? Explain.

(8+8)

(OR)

5. Explain followings with suitable diagrams:

(4×4=16)

- Bypass factor
  - Room sensible heat factor
  - Grand sensible heat factor
  - Effective room sensible heat factor
-

**7E7013**

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

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**7E7013****B.Tech. VII - Sem. (Back) Examination, January- 2023****Mechanical Engineering****7ME3A : Operations Research****Time : 3 Hours****Maximum Marks : 80****Min Passing Marks : 26****Instructions to Candidates:**

Attempt any **five** questions, selecting one question from each 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)

**UNIT-I**

1. Solve the following LPP:

**(16)**

$$\text{Max } z = 10x_1 + 6x_2$$

Subject to

$$x_1 + x_2 \leq 2$$

$$2x_1 + x_2 \leq 4$$

$$3x_1 + 8x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

**(OR)**

1. Solve the transportation problem for minimization.

**(16)****Destinations**

		D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Capacity
Sources	S <sub>1</sub>	2	2	3	10
	S <sub>2</sub>	4	1	2	15
	S <sub>3</sub>	1	3	1	40
Demand		20	15	30	

## UNIT-II

2. Use branch and bound technique to (16)

$$\text{Maximize } z = 3x_1 + 2x_2$$

Subject to

$$2x_1 + 2x_2 \leq 7$$

$$x_1 \leq 2$$

$$x_2 \leq 2$$

$x_1, x_2, \geq, 0$  are integers

(OR)

2. The cost of a machine is Rs.61,000 and its scrap value is Rs.1000. The maintenance costs found from the past experience are as follows: (16)

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs.)	1,000	2,500	4,000	6,000	9,000	12,000	16,000	20,000

When should the machine be replaced?

## UNIT-III

3. In a supermarket, the average arrival rate of customers is 10 every 30 minutes, following Poisson process. The average time taken by a cashier to list and calculate the customer's purchase in two and a half minutes following exponential distribution. What is the probability that the queue length exceeds six? What is the expected time spent by a customer in the system? (16)

(OR)

3. In a game of matching coins with two players, suppose A wins one unit of value when there are two heads, wins nothing when there are two tails and losses  $\frac{1}{2}$  unit of value when there are one head and one tail. Determine the pay-off matrix, the best strategies for each player and the value of the game to A. (16)

## UNIT-IV

4. Describe four methods which are useful for decision-making under uncertainty. (16)

(OR)

4. Describe ABC and VED inventory control techniques. (16)

## UNIT-V

5. A newspaper boy buys papers for Rs.3 each and sells them for Rs.7. He cannot return unsold newspapers. Daily demand has the following distribution. (16)

No. of customers	23	24	25	26	27	28	29	30	31	32
Probability	0.01	0.03	0.06	0.10	0.20	0.25	0.15	0.10	0.05	0.05

If each day's demand is independent of the previous day's. How many papers should he order each day?

(OR)

5. Explain random number generation techniques. Describe Monte-Carlo simulation technique. (16)

7E7014

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

[Total No. of Pages : 2]

7E7014

**B.Tech. VII - Sem. (Back) Examination, January - 2023**  
**Mechanical Engineering**  
**7ME4A Turbomachines**

**Time : 3 Hours**

**Maximum Marks : 80**  
**Min. Passing Marks : 26**

**Instructions to Candidates:**

*Attempt any **five** questions, selecting **one** question from **each** 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)*

**UNIT - I**

1. a) Derive an expression for specific speed of a hydraulic turbine. Also give its range for hydraulic turbines. (8)
- b) Write down the expression for the dimensionless power coefficient of a turbine stage. Prove that its proportional to the loading coefficient. (8)

**(OR)**

1. a) What is a turbo machines? Derive Euler's expression for turbo machines. (8)
- b) What is Similitude ? What are the different type of similarities between model and its prototype. (8)

**UNIT - II**

2. a) Explain surging, choking and stalling phenomenon in compressor. (8)
- b) What is meant by a stage and explain in detail the stage velocity triangles of axial flow compressor. (8)

**(OR)**

2. a) Draw a sketch of an axial flow compressor with inlet guide vane and explain working of it. (8)
- b) What is slip factor? A centrifugal impeller has 17 radial blades in the impeller of 45 cm diameter. Determine slip factor with three different formula. (8)

### UNIT - III

3. a) Derive the expression for minimum starting speed of centrifugal pump. (8)  
b) Briefly explain indicator diagram of a reciprocating pump. (8)

(OR)

3. a) Derive an expression for the work done by impeller of centrifugal pump. (8)  
b) Explain cavitation and method of prevention of it. (8)

### UNIT - IV

4. a) Draw a schematic diagram of a simple gas cycle with heat exchanger and explain briefly the working principal. (8)  
b) Write down various advantages and disadvantages of pulse jet engine. (8)

(OR)

4. a) Derive the expression for specific thrust and efficiency of Ramjet engine. (8)  
b) Explain working of turbo jet engine. (8)

### UNIT - V

5. a) What do you mean by blade and stage efficiency ? Derive an expression for both. (10)  
b) Explain with the help of H-S diagram working of reaction turbine. (6)

(OR)

5. What is meant by compounding? Explain with the help of diagram pressure and velocity compounding. (16)
-

7E7015

Total No. of Questions: 5

Total No. of Pages: 2

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

**B.Tech. VII sem(/Back) Exam 2023**  
**Mechanical Engineering**  
**7ME5A Operations Management**  
**7E7015**

**Time: 3Hours**

**Maximum Marks: 80**  
**Min Passing Marks: 26**

Attempt any **five questions**, selecting **one question** from **each 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 Briefly explain the strategic role of operations management. Explain the concept of strategy and compare service operation strategy with manufacturing strategy.

8+8=16

OR

Q.1 Define various forecast errors and discuss each in detail. Discuss in detail various qualitative methods of forecasting

8+8=16

**UNIT -II**

Q. 2 Define manufacturing process and explain various types of manufacturing processes

16

OR

Q.2 Explain capacity planning. Describe evaluation of alternative capacities using cost-volume analysis.

8+8=16

**UNIT -III**

Q. 3 What are the different factors to be considered in selecting plant location?

16

OR

Q.3 Explain the necessity and salient features of facilities layout planning. What is MPS? Explain the different techniques of MPS.

8+4+4=16

**UNIT -IV**

Q. 4 Define line balancing and how it is useful in mass production management. Explain about shop floor control concepts.

8+8=16

OR

Q.4 Explain the process and implementation of just-in-time.

16

## UNIT -V

Q. 5 Define supply chain. What is bullwhip effect in supply chain? Describe the causes and remedies of bullwhip effect.

4+4+8=16

OR

Q.5 Explain the following terms

- a) Work breakdown structure
- b) Critical path
- c) Crashing of projects
- d) Resource leveling

4\*4=16



Total No. of Questions:

Total No. of Pages:

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

661

**B.Tech. VII sem(Back) Exam 2023**  
**Mechanical Engineering**  
**7ME6.2A Robotics**  
**ME,PI**  
**7E7017**

**Time: 3Hours**

**Maximum Marks: 80**  
**Min Passing Marks: 26**

Attempt any **five questions**, selecting **one question** from **each 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. \_\_\_\_\_

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

**UNIT -I**

- Q. 1 Sketch and explain the four basic robot configurations classified according to the coordinate system. [16]

OR

- Q.1 (a) Write some applications of robots. What do you think of future of robots? [8]  
(b) With the help of line diagram, explain basic components of a Robot system. [8]

**UNIT -II**

- Q. 2 (a) Discuss about Vacuum Grippers along with their advantages and disadvantages. [8]  
(b) Explain about Robot motion planning. [8]

OR

- Q.2 a) What are the common types of arm explain? [8]  
b) What are the requirement and challenges of end effector? [8]

### UNIT -III

- Q. 3 a) Derive generalized equation for D-H convention. [8]  
b) Explain with an example the kinematic equations using homogeneous transformations robot end effector. [8]

OR

- Q.3 What are the common types of motion that a robot manipulator can make in travelling from point to point? [16]

### UNIT -IV

- Q. 4 a) What are the uses of sensor in robotics? What are the types of sensors used in robotics? [8]  
b) Explain about Force sensors with neat sketch. [8]

OR

- Q.4 a) Briefly explain the working principle of any two types of position sensors with neat sketch. [8]  
b) Explain Vision controlled robotic systems. [8]

### UNIT -V

- Q. 5 a) Define material transfer application? Explain about simple pick and operation with neat sketch. [8]  
b) List out some applications of robot. [8]

OR

- Q.5 a) Define the following commands:  
(i) WAIT (ii) SIGNAL (iii) DELAY [9]  
b) Explain the functioning of the following textual robot language commands:  
(i) DMOVE (ii) REACT [7]

7E7018	Roll No. _____	[Total No. of Pages : 2]
	<b>7E7018</b>	
	<b>B.Tech. VII - Sem. (Back) Examination, January - 2023</b> <b>Mechanical Engineering</b> <b>7ME6.3A : CNC Machines and Programming</b> <b>ME, PI</b>	
	<b>Time : 3 Hours</b> <span style="float: right;"><b>Maximum Marks : 80</b> <b>Min. Passing Marks : 26</b></span>	

**Instructions to Candidates:**

*Attempt any **Five** questions. Selecting **One** question from each 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)*

**UNIT - I**

1. a) What do you understand by NC system. Give classification of its? Discuss advantage of NC machine. (2+3+3)
- b) What are the historical development in automation? (8)

(OR)

1. a) Discuss the comparison of NC and Conventional machine with suitable example. Write in detail. (8)
- b) Explain briefly the history and application of NC system. (8)

**UNIT - II**

2. a) Explain all CNC Elements in detail. (8)
- b) Give all details about an Automatic Tool changer (8)

(OR)

2. a) Give all CNC Design considerations. (8)
- b) Explain spindle units and Coolant system of NC machine. (8)

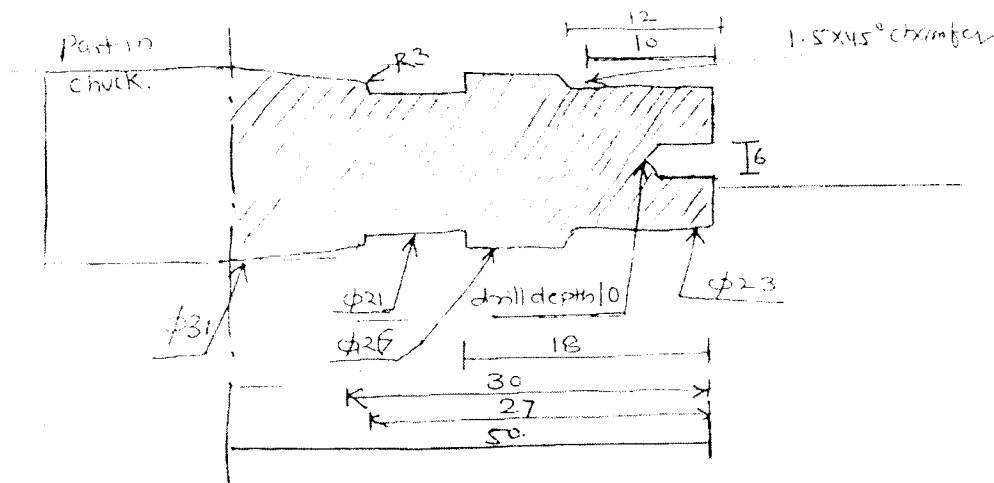
**UNIT - III**

3. a) What are the fundamental elements for developing manual part programming. (8)
- b) Write short note on:
  - i) Geometric modeling programming (4)
  - ii) Automation part program generation. (4)

(OR)

3. Write a part programming for given object.

(16)



#### UNIT - IV

4. a) What is CAPP? Explain in detail. (8)  
b) What is 5 axis programming? Write in detail. (8)

(OR)

4. a) Explain post processing and CNC simulation. (8)  
b) What do you understand by Kinematic and volumetric simulation? Write application of volumetric simulation. (8)

#### UNIT - V

5. a) What do you understand by adaptive control? Explain off-line adaptive control with neat sketch. Write in detail. (8)  
b) Explain the process of Rapid product development. (8)

(OR)

5. Write short note on. (4×4)  
a) CAM  
b) FM5  
c) CIM.  
d) HSC