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<b>R-19</b>
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**Code: 19A333T**

II B.Tech. I Semester Supplementary Examinations July/August 2022

**Basic Thermodynamics**  
( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks )

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Marks

<b>UNIT-I</b>
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- 1. a) Classify the types of thermodynamic systems with the help of suitable example. 7M
- b) Identify the differences between open system and closed system in thermodynamics. 7M

**OR**

- 2. A turbine operates under steady flow conditions, receiving steam at the following state: Pressure 1.2 MPa, temperature 188°C, enthalpy 2785 kJ/kg, velocity 33.3 m/s and elevation 3 m. The steam leaves the turbine at the following state: Pressure 20 kPa, enthalpy 2512kJ/kg, velocity 100 m/s, and elevation 0 m. Heat is lost to the surroundings at the rate of 0.29 kJ/s. If the rate of steam flow through the turbine is 0.42 kg/s, what is the power output of the turbine in kW? 14M

<b>UNIT-II</b>
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- 3. a) Write short notes on Second law of Thermodynamics. 7M
- b) An inventor claims to develop an engine which absorbs 100KW of heat from a reservoir at 1000K produces 60 kW of work and rejects heat to a reservoir at 500 K. Will u advise investment in its development? 7M

**OR**

- 4. a) Derive Maxwell relations and deduce two “Tds” equations 10M
- b) Define the following Terms i) Availability ii) Irreversibility 4M

<b>UNIT-III</b>
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- 5. a) Draw and explain P-V diagram for pure substance. 7M
- b) Steam enters in an engine at a pressure of 10 bar absolute and 250°C. It is exhausted at 0.2bar. The steam exhaust is 0.9dry. Find i) drop in enthalpy, ii) Change in entropy 7M

**OR**

- 6. a) Draw a neat sketch of throttling calorimeter and explain how dryness fraction of steam is determined. 7M

- b) Find the internal energy and enthalpy of unit mass of steam of a pressure of 7bar when (i) its quality is 80 % (ii) it is dry saturated (iii) Superheated the degree of superheat being 65 °C. 7M

<b>UNIT-IV</b>
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7. a) 1.5 kg of air at pressure 6 bar occupies a volume of 0.2 m<sup>3</sup>. If this air is expanded to a volume of 1.1 m<sup>3</sup>. Find the work done and heat absorbed or rejected by the air for each of the following methods. (i) Isothermal process (ii) Adiabatic process (iii) Polytropic process. 10M
- b) A spherical shaped balloon of 10 m diameter contains hydrogen at 33°C and 1.3 bar. Find the mass of hydrogen in the balloon. 4M

**OR**

8. a) Determine the pressure of nitrogen gas at T=175 K and v=0.00375m<sup>3</sup>/kg on the basis of (i) The ideal gas equation of state. (ii) The VanderWall's equation of state. The VanderWall's constant for nitrogen are a=0.175m<sup>6</sup> -kPa/kg; b=0.00138m<sup>3</sup> /Kg. 10M
- b) Briefly discuss on the deviation of perfect gas model. 4M

<b>UNIT-V</b>
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9. a) Briefly discuss about the Volumetric Analysis. 4M
- b) A gas mixture consists of 0.4kg of carbon monoxide and 1.1 kg of carbon dioxide Calculate the mass fraction, mole fraction, molar mass and gas constant. 10M

**OR**

10. a) The following volumetric composition relate to a mixture of gases: - N<sub>2</sub> = 81%, CO<sub>2</sub>=11%, O<sub>2</sub>= 6%, CO = 2% Determine i) the gravimetric composition. ii) Molecular weight and iii) gas constant R for the mixture. 10M
- b) Establish the relation between mass fraction and mole fraction 4M

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II B.Tech. I Semester Supplementary Examinations July/August 2022

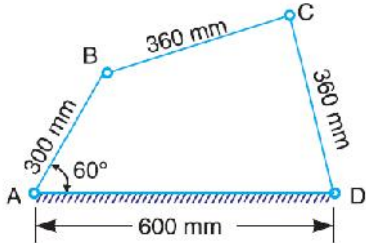
**Kinematic of Machinery**  
( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

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	Marks	CO	Blooms Level
<b>UNIT-I</b>			
1. Explain with sketches all inversions of quadric cycle chain.	14M	1	2
<b>OR</b>			
2. Sketch and explain Whitworth quick return motion mechanism.	14M	1	4
<b>UNIT-II</b>			
3. In a pin jointed four bar mechanism, as shown in Fig, AB = 300 mm, BC = CD = 360 mm, and AD = 600 mm. The angle BAD = 60°. The crank AB rotates uniformly at 100 r.p.m. Locate all the instantaneous centres and find the angular velocity of the link BC.			
	14M	2	4
<b>OR</b>			
4. The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine : 1. Linear velocity and acceleration of the midpoint of the connecting rod, and 2. angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position.	14M	2	3
<b>UNIT-III</b>			
5. Sketch the Hart's straight line motion mechanism and prove that the tracing point 'P' describes a straight line path.	14M	3	4
<b>OR</b>			
6. How can you show that a watt mechanism trace an approximate straight line?	14M	3	1
<b>UNIT-IV</b>			
7. Derive an expression for the minimum number of teeth required on the wheel in order to avoid interference in involute gear teeth.	14M	4	6
<b>OR</b>			
8. A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio.	14M	4	3
<b>UNIT-V</b>			
9. A cam is to be designed for a knife edge follower with the following data : 1. Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion. 2. Dwell for the next 30°. 3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion. 4. Dwell during the remaining 180°. Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft. The radius of the base circle of the cam is 40 mm.	14M	5	6
<b>OR</b>			
10. Discuss about various types of followers.	14M	5	2

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Hall Ticket Number :

**R-19**

**Code: 19AC34T**

II B.Tech. I Semester Supplementary Examinations July/August 2022

**Life Sciences for Engineers**

( Common to CE, ME & CSE )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks )

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**UNIT-I**

- |  | Marks | CO  | Blooms Level |
|--|-------|-----|--------------|
| 1. Describe meant by classification? Write the importance of Classification?                                       | 14M   | CO1 | 2            |
| <b>OR</b>  |       |     |              |
| 2. a) Explain the five kingdom classification of living organisms?   | 7M    | CO1 | 2            |
| b) Describe is Endoplasmic reticulum? Write their structure and important functions and draw the labelled diagram? | 7M    | CO1 | 2            |

**UNIT-II**

- |   |     |     |   |
|---|-----|-----|---|
| 3. a) Describe the structure of DNA & RNA?                                  | 7M  | CO2 | 2 |
| b) Explain Lock and Key Model and Induced fit model?                        | 7M  | CO2 | 2 |
| <b>OR</b>   |     |     |   |
| 4. Describe the Biomolecules and write functions and types of biomolecules? | 14M | CO2 | 4 |

**UNIT-III**

- |   |     |     |   |
|---|-----|-----|---|
| 5. Describe about Bioenergetics and types of Bioenergetics? | 14M | CO3 | 2 |
| <b>OR</b>   |     |     |   |
| 6. Discuss the mechanism of photosynthesis in plants?       | 14M | CO3 | 4 |

**UNIT-IV**

- |  |     |     |   |
|--|-----|-----|---|
| 7. a) Describe the sequential steps in the replication of DNA? | 7M  | C04 | 2 |
| b) Write the importance of Genetic code?                       | 7M  | C04 | 1 |
| <b>OR</b>  |     |     |   |
| 8. Describe the Gene Disorders in Humans?                      | 14M | C04 | 4 |

**UNIT-V**

- |  |     |     |   |
|--|-----|-----|---|
| 9. Describe the Biosensors, types and applications?        | 14M | CO5 | 2 |
| <b>OR</b>  |     |     |   |
| 10. Explain the Transgenic species and process in animals? | 14M | CO5 | 2 |

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**R-19**

**Code: 19A332T**

II B.Tech. I Semester Supplementary Examinations July/August 2022

**Metallurgy and Material Science**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

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		Marks
<b>UNIT-I</b>		
1.	What are the methods used for measuring the grain size? Discuss any two of them.	14M
<b>OR</b>		
2.	State and explain Hume Rothery's rules for the formation of Substitutional solid solution.	14M
<b>UNIT-II</b>		
3.	a) Briefly explain the methods used for construction of Equilibrium diagrams.	7M
	b) Draw the phase diagram for an Isomorphous system.	7M
<b>OR</b>		
4.	a) Classify Equilibrium diagrams	7M
	b) Define Liquidus line, Solidus line and Solvus line.	7M
<b>UNIT-III</b>		
5.	a) Give the classification of steels. Describe the typical applications of low, medium and high carbon steels.	8M
	b) Discuss about Hadfield manganese steels	6M
<b>OR</b>		
6.	Describe briefly the properties and applications of copper and its alloys	14M
<b>UNIT-IV</b>		
7.	Explain about stress relieving annealing and full annealing	14M
<b>OR</b>		
8.	a) Differentiate between Annealing and Normalizing	7M
	b) Differentiate between carburizing and Nitriding	7M
<b>UNIT-V</b>		
9.	Explain any two methods of manufacture of composites	14M
<b>OR</b>		
10.	Briefly explain metal matrix composites and Carbon-Carbon composites	14M

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**Code: 19A331T**

II B.Tech. I Semester Supplementary Examinations July/August 2022

**Mechanics of Solids**  
( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks )

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**UNIT-I**

1. a) Draw the stress-strain diagram of mild steel specimen subjected to tensile test and explain the salient points. Marks  
7M  
b) An aluminium bar 60mm diameter when subjected to an axial tensile load 100KN elongates 0.20mm in a gauge length 300mm and the diameter is decreased by 0.012mm. Calculate the modulus of elasticity and the Poisson's ratio of the material. 7M

**OR**

2. a) Draw Mohr's circle when the component is subjected to mutually perpendicular tensile stresses. 7M  
b) Prove that the maximum stress induced in a body due to suddenly applied load is twice the stress induced when the same load is applied gradually. 7M

**UNIT-II**

3. a) What are the different types of beams? 4M  
b) Draw the shear force and B.M diagram for a simply supported beam of length 8m and carrying a uniformly distributed load of 12KN/m for a distance of 4m from the left end. Also calculate the maximum B.M on the section. 10M

**OR**

4. A beam of 12 m long is supported at 2 m and 10 m from the left end. It carries uniformly distributed loads of 15 kN/m over both overhanging lengths along with a clockwise couple load of 220 kN-m at mid-span. Draw the shear force and bending moment diagrams for the beam. Find the position and magnitudes of maximum bending moment and the position of the point of contra flexure. 14M

**UNIT-III**

5. Prove that for a rectangular section the maximum shear stress is 1.5times the average stress. Sketch the variation of shear stress. 14M

**OR**

6. A beam is simply supported and carries a U.D.L of 40kN/m run over the whole span. The section of the beam is rectangular having depth as 500mm. If the maximum stress in the material of the beam is 120N/mm<sup>2</sup> and moment of inertia of the section is  $7 \times 10^8 \text{ mm}^4$ , find the span of the beam. 14M

**UNIT-IV**

7. A beam of 6 meter long simply supported at its ends, carries a point load 'W' at its centre. If the slope at the ends of the beam is not to exceed  $1^\circ$ , find the maximum deflection. 14M

**OR**

8. A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a UDL of 9 kN/m over the entire span of 5 m. If the value of E for the beam material is  $1 \times 10^4 \text{ N/mm}^2$ , find (i) The slope at support ends and (ii) maximum deflection 14M

**UNIT-V**

9. State and explain Lamé's theory for thick cylindrical shells. Derive the Lamé's equations. 14M

**OR**

10. A spherical shell of 90mm internal diameter has to with stand an internal pressure of 35N/mm<sup>2</sup>. Find the thickness of the shell required. The maximum permissible tensile stress is 80N/mm<sup>2</sup>. 14M

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<b>R-19</b>
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**Code: 19AC31T**

II B.Tech. I Semester Supplementary Examinations July/August 2022

**Partial Differential Equations and Complex Variables**

( Common to All Branches )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks )

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Marks	CO	Blooms Level
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**UNIT-I**

- |   |    |     |    |
|---|----|-----|----|
| 1. a) Find the Laplace Transform of $e^{2t} + 4t^3 - 2 \sin 3t + 3 \cos 3t$ | 7M | CO1 | L1 |
| b) Find the L.T of $(t^2 + 1)^2$  | 7M | CO1 | L1 |

**OR**

- |   |     |     |    |
|---|-----|-----|----|
| 2. Find $L \left\{ e^{-3t} \int_0^t \frac{\sin t}{t} dt \right\}$ | 14M | CO1 | L1 |
|---|-----|-----|----|

**UNIT-II**

- |   |     |     |    |
|---|-----|-----|----|
| 3. Find inverse L.T of $\frac{5s - 2}{s^2(s + 2)(s - 1)}$ | 14M | CO2 | L1 |
|---|-----|-----|----|

**OR**

- |  |     |     |    |
|--|-----|-----|----|
| 4. Using convolution theorem , find $L^{-1} \left\{ \frac{1}{(s + a)(s + b)} \right\}$ | 14M | CO2 | L3 |
|--|-----|-----|----|

**UNIT-III**

- |  |     |     |    |
|--|-----|-----|----|
| 5. Obtain the Fourier series for $f(x) = x - x^2$ in the interval $[-f, f]$ . Hence Show that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{f^2}{12}$ | 14M | CO3 | L3 |
|--|-----|-----|----|

**OR**

- |  |     |     |    |
|--|-----|-----|----|
| 6. Find the half range sine series for $f(x) = x(f - x)$ in $0 < x < f$ deduce that $\frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} + \dots = \frac{f^2}{32}$ | 14M | CO3 | L1 |
|--|-----|-----|----|

**UNIT-IV**

- |  |     |     |    |
|--|-----|-----|----|
| 7. Use separation of variables to solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial y} + 2u$ in the form $u = f(x)g(y)$ . Obtain the solution satisfying $u = 0, \frac{\partial u}{\partial x} = 1 + e^{-3y}$ when $x = 0$ for all values of $y$ . | 14M | CO4 | L3 |
|--|-----|-----|----|

**OR**

- |  |     |     |    |
|--|-----|-----|----|
| 8. A homogeneous rod of conducting material of length 100 cm has its ends kept at zero temperature and the temperature initially is $u(x,0) = \begin{cases} x & ; 0 \leq x \leq 50 \\ (100 - x) & ; 50 \leq x \leq 100 \end{cases}$ Find the temperature $u(x,t)$ at any time. | 14M | CO4 | L3 |
|--|-----|-----|----|

**UNIT-V**

- |  |     |     |    |
|--|-----|-----|----|
| 9. Find the conjugate harmonic function of the harmonic function $u = x^2 - y^2$ | 14M | CO5 | L1 |
|--|-----|-----|----|

**OR**

- |  |     |     |    |
|--|-----|-----|----|
| 10. Evaluate $\int_c \frac{e^{2z}}{(z - 1)(z - 2)} dz$ where $c :  z  = 3$ . | 14M | CO5 | L5 |
|--|-----|-----|----|

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**Code: 19A236T**

II B.Tech. I Semester Supplementary Examinations July/August 2022

**Basic Electrical and Electronics Engineering**

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks )

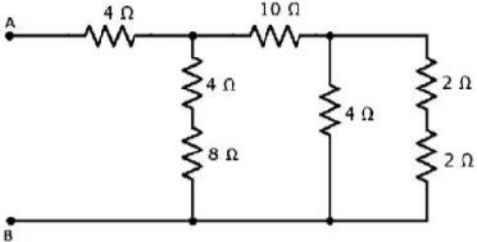
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**UNIT-I**

- |   | Marks | CO  | Blooms Level |
|---|-------|-----|--------------|
| 1. a) State the voltage, current and power relationships for<br>i) Resistance ii) Inductance iii) capacitance | 7M    | CO1 | L2           |
| b) State the limitations Ohms law and discuss its limitations of it.  | 7M    | CO1 | L2           |

**OR**

- |  |    |     |    |
|--|----|-----|----|
| 2. a) State Kirchoff's Voltage and Current Laws with the help of an example.               | 7M | CO1 | L2 |
| b) Determine the equivalent resistance between A and B terminals in the following network. |    |     |    |



**Fig.2**

**UNIT-II**

- |   |     |     |    |
|---|-----|-----|----|
| 3. With a Help of a Neat diagram explain the Construction of the Dc Motor.      | 14M | CO2 | L2 |
| <b>OR</b>   |     |     |    |
| 4. Explain Swinburne's test for the determination of efficiency of a dc machine | 14M | CO2 | L2 |

**UNIT-III**

- |  |     |     |    |
|--|-----|-----|----|
| 5. Briefly Explain the Emf Method for the evaluation of Voltage regulation of Alternator by conducting suitable test.                    | 14M | CO3 | L2 |
| <b>OR</b>  |     |     |    |
| 6. a) With the help of a neat diagram Explain the procedure for evaluating the performance and efficiency of three phase induction motor | 10M | CO3 | L2 |
| b) What are the applications of three phase induction motor  | 4M  | CO3 | L1 |

**UNIT-IV**

- |   |     |     |    |
|---|-----|-----|----|
| 7. Briefly Explain the operation of Bridge Rectifier with necessary diagrams and derive the following terms<br>i) Dc Output voltage ii) Peak Inverse Voltage iii) Ripple Factor | 14M | CO4 | L2 |
| <b>OR</b>   |     |     |    |
| 8. a) Discuss the working of NPN and PNP transistor with a neat sketch  | 7M  | CO4 | L2 |
| b) Explain how a p-n junction diode acts as a rectifier and derive the current equation of a p-n junction diode.  | 7M  | CO4 | L2 |

**UNIT-V**

- |  |     |     |    |
|--|-----|-----|----|
| 9. Explain the procedure for evaluating the following parameters using CRO.<br>i) Time Period ii) Frequency iii) Amplitude iv) Current | 14M | CO5 | L2 |
| <b>OR</b>  |     |     |    |
| 10. a) Draw the block diagram of general purpose CRO. Explain the functions of various blocks?   | 7M  | CO5 | L2 |
| b) Explain the theory of induction heating. State its advantages and industrial applications   | 7M  | CO5 | L2 |

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