Hall Ticket Number :										

R-20

Code: 20A333T

II B.Tech. I Semester Regular & Supplementary Examinations February 2023

Basic Thermodynamics

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

		CO	BL
1.	Answer ***all*** the following short answer questions (5 X 2 = 10M)		
a)	List the limitations of First Law of Thermodynamics.	1	L1
b)	Compare refrigerator and heat pump.	2	L2
c)	Define triple point and critical point for pure substance.	3	L1
d)	How does the Vander Waals equation differ from the ideal gas equation of state?	4	L2
e)	State the assumptions in Air standard cycle.	5	L1

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL
	UNIT–I			
2.	A three process cycle operating with nitrogen as working substances has a constant temperature compression at 34◦C with initial pressure 100 kPa. Then the gas undergoes a constant volume heating and then polytropic expansion with 1.35 as index of compression. The isothermal compression requires -67kJ/kg of the work. Determine (i) P, v and T around the cycle (ii) Heat in and out (iii) Network done. For nitrogen gas, c_v=0.7431kJ/kg. Molecular weight=28.02 kg/kg-mol.	12M	1	L3
	OR			
3.	In a gas turbine unit, the gases flow through the turbine is 15 kg/s and the power developed by the turbine is 12MW. The enthalpies of gases at the inlet and outlet are 1260 kJ/kg and 400 kJ/kg respectively, and the velocity of gases at the inlet and outlet are 50 m/s and 110 m/s respectively. Calculate: i) The rate at which heat is rejected to the turbine, and ii) The area of the inlet pipe given that the specific volume of the gases at the inlet is 0.45 m^3/kg.	12M	1	L3
	UNIT–II			
4.	An irreversible heat engine with 66% efficiency of the maximum possible is operating between 1000 K and 300 K. If it delivers 3 kW of work, determine the heat extracted from the high temperature reservoir and heat rejected to low temperature reservoir.	12M	2	L3

OR

5.	Derive Maxwell relations.	12M	2	L3

UNIT–III

6.	Steam at 120 bar has a specific volume of 0.01721 m^3/kg, find the temperature, enthalpy and the internal energy.	12M	3	L3

OR

7.	Find the specific volume, enthalpy and internal energy of wet steam at 18 bar with dryness fraction (x) = 0.85, by using Steam Tables and Mollier chart.	12M	3	L3

UNIT–IV

8.	A container of 3 m^3 capacity contains 10 kg of CO_2 at 27 ^{0}C. Estimate the pressure exerted by CO_2 by using (i) Perfect gas equation (ii) Vanderwaals equation a = 362850 Nm4 /(kg-mol)2 and b=0.0423 m3 /(kg-mol).	12M	4	L3

OR

9.	A vessel contains at 1 bar and 20°C a mixture of 1 mole of CO_2 and 4 moles of air. Calculate for the mixture : (i) The masses of CO_2, O_2 and N_2, and the total mass (ii) The percentage carbon content by mass (iii) The apparent molecular weight and the gas constant for the mixture (iv) The specific volume of the mixture. The volumetric analysis of air can be taken as 21% oxygen and 79% nitrogen.	12M	4	L3

UNIT–V

10.	An engine works on Otto cycle. The initial pressure and temperature of the air is 1 bar and 40 ^{o}C. 825 kJ of heat is supplied per kg of air at the end of compression. Find the temperature and pressure at all salient points if the compression ratio is 6. Also find the efficiency and mean effective pressure for the cycle. Assume air is used as the working fluid and take all ideal conditions.	12M	5	L3

OR

11.	Two engines are to operate on Otto and Diesel cycles with the following data: Maximum temperature=1400 K Exhaust temperature =700 K State of air at the beginning of compression = 0.1 MPa, 300 K. Estimate i. The compression ratios ii. The maximum pressures iii. Rate of work outputs (for 1 kg/min of air) of the respective cycles	12M	5	L3

*** End ***

Hall Ticket Number :										

R-20

Code: 20A332T

II B.Tech. I Semester Regular & Supplementary Examinations February 2023

Manufacturing processes

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. Answer ***all*** the following short answer questions (5 X 2 = 10M)		CO	BL
a)	Write any four pattern allowances.	CO1	L1
b)	Differentiate soldering and Brazing processes.	CO2	L2
c)	Define Hot working and cold working.	CO3	L1
d)	Identify any four defects in forging.	CO4	L1
e)	How do you classify plastics?	CO5	L2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
		UNIT–I			
2.	a)	Describe investment casting process.	6M	CO1	L2
	b)	Explain Types of Risers and their function.	6M	CO1	L3
		OR			
3.	a)	Discuss various defects in the casting process.	6M	CO1	L2
	b)	Illustrate Concept of Solidification for pure metal and alloys.	6M	CO1	L3
		UNIT–II			
4.	a)	Explain different weld defects?	6M	CO2	L2
	b)	Compare Soldering, Brazing, and Welding and mention their applications.	6M	CO2	L3
		OR			
5.	a)	Differentiate TIG and MIG welding.	6M	CO2	L2
	b)	Explain destructive and nondestructive testing of welds.	6M	CO2	L3
		UNIT–III			
6.	a)	Analyze re-crystallization and grain growth of metals during hot working process.	6M	CO3	L4

	b)	Argue different defects in rolled products.	6M	CO3	L5

OR

7.	a)	Classify Rolling mills and explain any one Rolling mill operation.	6M	CO3	L4
	b)	Analyze stamping and forming cold working processes.	6M	CO3	L5

UNIT–IV

8.	a)	Explain Forward and backward extrusion process.	6M	CO4	L2
	b)	Discuss Roll forging process and mention where it is used?	6M	CO4	L3

OR

9.	a)	Describe Hydrostatic extrusion processes.	6M	CO4	L2
	b)	Discuss different forging defects.	6M	CO4	L3

UNIT–V

10.	a)	Summarize the various differences between thermoplastics and thermosetting plastics?	6M	CO5	L1
	b)	Elaborate steel making using crucible process?	6M	CO5	L2

OR

11.	a)	How do you classify plastics and mention properties of any two widely used plastics.	6M	CO5	L1
	b)	Explain the steps involved in powder metallurgy?	6M	CO5	L2

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC31T

II B.Tech. I Semester Regular & Supplementary Examinations February 2023

Partial Differential Equations and Numerical Methods

(Common to CE and ME)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

		CO	BL
1.	Answer ***all*** the following short answer questions (5 X 2 = 10M)		
a)	Write the Newton-Raphson formula to the approximate root of the equation f(x)=0. Also explain when Newton-Raphson method fails?	CO1	L2
b)	Find the interpolating polynomial for the data (1, 2) and (2, 4).	CO2	L2
c)	State the Simpson's 1/3rd & 3/8th rule for evaluating $\int_{x_0}^{x_n} f(x)dx$	CO3	L1
d)	Briefly explain the Runge-Kutta method of fourth order.	CO4	L2
e)	Write the all possible solutions of 2D-Laplace equation.	CO5	L3

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL

UNIT–I

2.	a)	Find the root of equation $x^3 - 2x - 5 = 0$ using the bisection method correct to three decimal places	6M	CO1	L3
	b)	Find the fourth root of 32 correct to four decimal places by choosing regula-falsi method.	6M	CO1	L4

OR

3.	a)	Using Newton Raphson method, find a real root of the equation $x\sin x + \cos x = 0$.	6M	CO1	L3
	b)	Find a root of $x^3 - x - 1 = 0$ by choosing Iteration method.	6M	CO1	L4

UNIT–II

4. a) Estimate the value of *f* (22) from the following data.

X	20	25	30	35	40	45
f(x)	354	332	291	260	231	204

6M CO2 L3

b) The population of a town in decimal census was as given below. Estimate the population for the year 1955.

Year x	1921	1931	1941	1951	1961
Population y	46	66	81	93	101

6M CO2 L3

OR

5. a) From the following table, estimate the number of students who obtained marks between 40 and 45.

Marks:	30-40	40-50	50-60	60-70	70-80
No. of students:	31	42	51	35	31

6M CO2 L4

b) Using Lagrange's interpolation formula, calculate y(2) from the table

x	0	1	3	4
y	-12	0	12	24

6M CO2 L4

UNIT–III

6. Given that

x: 1.0 1.1 1.2 1.3 1.4 1.5 1.6

f(x): 7.989 8.403 8.781 9.129 9.451 9.750 10.031

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x =1.0 12M CO3 L4

OR

7. a) Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\cos\theta}\, d\theta$ by dividing the integral into 6 parts using trapezoidal rule and Simpson's 1/3rd rule. 6M CO3 L3

b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ Using Simpson's 3/8th rule. 6M CO3 L3

UNIT–IV

8. a) Apply Euler's method to find y for $x = 0.1$ for $\frac{dy}{dx} = x + y + xy, \quad y(0) = 1,$ taking step size 0.025. 6M CO4 L3

b) Given $\frac{dy}{dx} = x + y^2,\ y(0) = 1,\quad h = 0.2$, Calculate $y(0.2)$ using Runge Kutta method. 6M CO4 L4

OR

9. a) Find the value of y for x = 0.1, by Picard's method, given that $\frac{dy}{dx} = \frac{y-x}{y+x},\ y(0) = 1.$ 6M CO4 L4

b) Solve by Taylor's series method the equation $\frac{dy}{dx} = \log(xy)$ for $y(1.1)$, given $y(1) = 2.$ 6M CO4 L3

UNIT–V

10. A string is stretched and fastened at two point *l* apart. Motion is started by displacing the string in the form $y = a\sin\left(\frac{\pi x}{l}\right)$ from which it is released at time t = 0. Show that the displacement of the string $y(x,t) = a\sin\left(\frac{\pi x}{l}\right)\cos\left(\frac{\pi ct}{l}\right).$ 12M CO5 L2

OR

11. An infinitely long plane uniform plate is bounded by two parallel edges and an end at right angles to them. The breadth is π; this end is maintained at a temperature u_0 at all points and other edges are at zero temperature. Determine the temperature at any point of the plate in the steady state. 12M CO5 L4

*** End ***

Hall Ticket Number :										

R-20

Code: 20A331T

II B.Tech. I Semester Regular & Supplementary Examinations February 2023

Mechanics of Solids

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

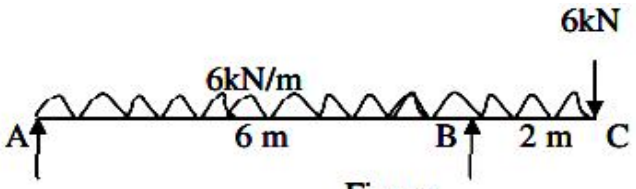
1. Answer all the following short answer questions (5 X 2 = 10M)	**CO**	**BL**
a) Define strength and give one example	1	2
b) Enumerate the relationship between load, shear force and bending moment	2	1
c) If there are two beams with cross sectional dimensions 100*50, and 50*100. Which one is stronger in bending?	3	2
d) What are the different methods used to find out the slope and deflection at a section in a loaded Beam?	4	1
e) Define longitudinal Stress and circumferential Stress.	5	2

PART-B

Answer five questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL
	UNIT–I			
2.	A specimen of steel 25 mm diameter with a gauge length of 200 mm is tested to destruction. It has an extension of 0.16 mm under a load of 80 kN and the load at elastic limit is 160 kN. The maximum load is 180 kN. The total extension at fracture is 56 mm and the diameter at the neck is 18 mm. Find (i) the stresses at elastic limit, (ii) Young's Modulus, (iii) Percentage elongation, (iv)Percentage reduction in area and, (v)Ultimate tensile stress.	12M	1	3
	OR			
3.	A bar of 25 mm diameter is tested in tension. It is observed that when a load of 60kN is applied, the extension measured over a gauge length of 200 mm is 0.12mm and contraction in diameter is 0.0045 mm. Find the Poisson's ratio and elastic constants E, G, K.	12M	1	3
	UNIT–II			
4.	A simply supported beam of span 10 m carries point loads 6 kN each at distance of 3 m and 5 m from left support. Draw the S.F and B.M diagrams for the beam.	12M	2	3
	OR			

5. An overhanging beam is shown in figure. Draw the S.F and B.M diagrams



Figure

12M 2 3

UNIT–III

6. A beam is simply supported and carries a uniformly distributed load of 40 kN/m for the whole span. The section of the beam is rectangular having depth as 500 mm. If the maximum stress in the material of the beam is 120 N/mm^2 and moment of inertia of the section is 7x10^8 mm^4, find the span of the beam. 12M 3 3

OR

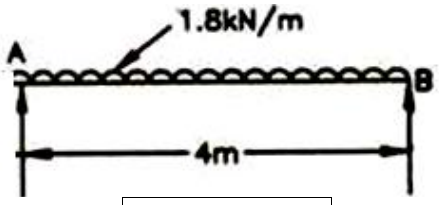
7. A T – section beam with 100 mm x 15 mm flange and 150 mm x 15 mm web is subjected to a shear force of 10 kN at a section. Draw the variation of shear stress across the depth of the beam and obtain the value of maximum shear stress of the section. 12M 3 3

UNIT–IV

8. A 300 mm long cantilever of rectangular section 48 mm wide and 36 mm deep carries a uniformly distributed load. Calculate the value of load w if the maximum deflection in the cantilever is not to exceed 1.5mm. Take E = 120 GPa. 12M 4 3

OR

9. Find the deflection of a rectangular beam as shown below of cross section 10 cm X 6 cm at the midpoint of the length. Take E = 10^4 KN/cm^2.



12M 4 3

UNIT–V

10. A cylindrical vessel is 1.6m diameter and 5m long is closed at ends by rivets. It is subjected to an internal pressure of 4 N/mm^2. If the maximum principal stress is not to exceed 120 N/mm^2, find the thickness of the shell. Also find change in diameter, length and volume of the vessel by assuming E = 2 x 10^5 N/mm^2 and Poisson's ratio = 0.25. 12M 5 3

OR

11. A cylindrical shell 1m long, 180mm internal diameter, thickness of metal 8mm is filled with a fluid at atmospheric pressure. If an additional 20,000mm^3 of the fluid is pumped in to the cylinder. Find the pressure exerted by the fluid on the wall of the cylinder and also find the hoop stress is induced take E=2×10^5 N/mm^2 and Poisson's ratio = 0.3 12M 5 3

*****END*****

Hall Ticket Number :										

R-20

Code: 20A235T

II B.Tech. I Semester Regular & Supplementary Examinations February 2023

Basic Electrical and Electronics Engineering

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

		CO	BL
1.	Answer all the following short answer questions (5 X 2 = 10M)		
a)	Define voltage	1	1
b)	Explain the use of commutator	2	2
c)	Write the formula for calculating the efficiency of transformer?	3	2
d)	Sketch the V-I Characteristic of PN Junction diode	4	2
e)	Enumerate the applications of CRO	5	2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
		UNIT–I			
2.	a)	Differentiate between static and dynamic emf with examples	8M	1	4
	b)	Outline in brief about Right hand thumb rule and Right hand palm rule	4M	1	3
		OR			
3.	a)	Describe Faraday's laws of electromagnetic induction	6M	1	3
	b)	Explain in detail about Kirchoff's laws	6M	1	3
		UNIT–II			
4.		Illustrate with neat diagram the constructional details of DC Generator and explain its principle of operation.	12M	2	4
		OR			
5.	a)	Derive an expression for torque of a DC motor	6M	2	4
	b)	Write a brief note on brake test of a DC motor	6M	2	3
		UNIT–III			
6.		Develop an expression for emf of 1-Ø transformer	12M	3	4
		OR			
7.		Discuss in detail about Regulation by synchronous impedance method	12M	3	4
		UNIT–IV			
8.	a)	Explain in detail the working of full wave bridge rectifier	8M	4	4
	b)	How do you operate a PN Junction diode as a switch?	4M	4	5
		OR			
9.		With relevant characteristic curves explicate the operation of CE configuration PNP transistor	12M	4	4
		UNIT–V			
10.		With neat Block diagram of CRO enlighten in detail the principle of operation of CRT	12M	5	4
		OR			
11.		Elucidate the different types of wires and cables used for electrical installations	12M	5	3

*** End ***