Hall Ticket Number :										

R-15

Code: 5G531

II B.Tech. I Semester Supplementary Examinations November 2023

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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			Marks
		UNIT–I	
1.	a)	Explain various types of stresses and strains.	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)	Derive the relationship between young's modulus, modulus of rigidity and bulk modulus.	7M
	b)	Draw Mohr's circle when the component is subjected to mutually perpendicular tensile stresses.	7M
		UNIT–II	
3.	a)	What are the different types of beams?	5M
	b)	A cantilever of length 2 m carries a of 1 kN/m run over a length of 1.5 m from the free end. Draw the shear force and bending moment diagrams for the cantilever.	9M
		OR	
4.	a)	Define point of contra flexure.	3M
	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.	11M
		UNIT–III	
5.	a)	Prove that for a rectangular section the maximum shear stress is 1.5times the average stress. Sketch the variation of shear stress.	8M
	b)	Derive the section modules for (a) rectangular section and (b) circular section	6M
		OR	
6.	a)	Derive the section modules for a hollow rectangular section	4M
	b)	A timber beam 120m wide and 185mm deep supports a u.d.l of intensity w KN/m length over a span of 2.7m. If the safe stresses are 29Mpa in bending and 3Mpa in shear, calculate the safe intensity of the load which can be supported by the beam.	10M
		UNIT–IV	
7.	a)	Derive an expression for slope and deflection at free end of a cantilever beam subjected to UDL over entire span.	7M
	b)	Define Macaulay's method? And find out Deflection of a simply supported beam with an Eccentric point load	7M
		OR	
8.		A rectangular reinforced concrete simply supported beam of length 2 m and cross section 100 mm x 200 mm is carrying an uniformly distributed load of 10 kN/m through its span. Find the maximum slope and deflection. Take $E=2 \times 10^4$ N/mm^2.	14M
		UNIT–V	
9.		State and explain Lame's theory for thick cylindrical shells. Derive the Lame's equations.	14M
		OR	
10.		Determine the maximum and minimum hoop stress across the section of a pipe of 400mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution across the section.	14M

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Hall Ticket Number :										

R-15

Code: 5G533

II B.Tech. I Semester Supplementary Examinations November 2023

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
		UNIT–I	
1.	a)	What is meant by displacement work? Explain the same with reference to the Quasi-static process.	7M
	b)	Classify the types of thermodynamic systems with the help of suitable example.	7M
		OR	
2.	a)	Prove that Internal energy is a property of the system.	6M
	b)	A mass of gas is compressed in a quasi-static process from 80KPa, 0.1m^3 to 0.4 MPa, 0.03m^3. Assuming that pressure and volume are related by PV^n= constant. Find the work interaction during the process. Identify whether it a work producing system or work absorbing system.	8M
		UNIT–II	
3.	a)	Write short notes on Second law of Thermodynamics.	7M
	b)	Bring out the concept of entropy and importance of T-s diagram.	7M
		OR	
4.	a)	Calculate the entropy change of the universe as a result of the following processes: i) A copper block of 750 g mass and with Cp of 150 J/kg K at 100°C is placed in a lake at 9°C. ii) The same block at 9°C is dropped from a height of 100 m into the lake. iii) Two such blocks at 100 and 0°C are joined together.	14M
		UNIT–III	
5.	a)	Explain the concept of Triple point.	7M
	b)	Draw and explain P-T diagram for pure substance	7M
		OR	
6.	a)	Find the internal energy and enthalpy of unit mass of steam of a pressure of 7 bar when (i) its quality is 80% (ii) it is dry saturated (iii) Superheated the degree of superheat being 65 ^{0}C.	14M
		UNIT–IV	
7.	a)	Explain Throttling process and Free expansion process.	10M
	b)	A spherical shaped balloon of 10 m diameter contains hydrogen at 33 ^{0}C and 1.3 bar. Find the mass of hydrogen in the balloon.	4M
		OR	
8.	a)	A constant volume chamber of 0.3 m^3 capacity contains 2 kg of this gas at 5^{0}C. Heat is transferred to the gas until the temperature is100^{0}C. Find the work done, the heat transferred and the changes in internal energy, enthalpy and entropy.	10M
	b)	Write a short note on compressibility factor.	4M
		UNIT–V	
9.	a)	Write a short note on the Gravimetric Analysis.	6M
	b)	Explain Mass fraction .Mole fraction, Internal energy and specific heat of gas mixtures	8M
		OR	
10.	a)	A Vessel of 5 m^3 capacity contains two gases A and B in proportion of 40% and 60% respectively at 25^{0}C .If the value of R for the gases is 0.288 kj/kgK and 0.295kj/kgK and if the total weight of the mixture is 2 kg calculate (i) partial pressure (ii) total pressure (iii) the mean value of gas constant for the mixture.	14M

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Hall Ticket Number :										

R-15

Code: 5GC31

II B.Tech. I Semester Supplementary Examinations November 2023

Engineering Mathematics-III

(Common to CE & ME)

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) Find the Eigen values and eigenvectors of $A=\begin{bmatrix}5 & 4\\ 1 & 2\end{bmatrix}$ 7M

   b) Test for consistency and solve 5x+3y+7z=4; 3x+26y+2z=9; 7x+2y+10z=5 7M

OR

2. a) Verify Cayley-Hamilton theorem for the matrix $A=\begin{bmatrix}1 & 1 & 2\\ 3 & 1 & 1\\ 3 & 3 & 1\end{bmatrix}$ and hence find A^4. 7M

   b) Investigate the values of λ and μ so that the equations
   2x+3y+5z=9; 7x+3y-2z=8; 2x+3y+λz=μ
   have (i) no solution (ii) a unique solution and (iii) an infinite number of solutions 7M

UNIT–II

3. a) Find a root of the equation $x^2-4x-9=0$ using bisection method correct to three decimal places 8M

   b) Find the missing term in the table

x	2	3	4	5	6
y	45	49.2	54.1	-	67.4

6M

OR

4. From the following table of values of 'x' and 'y', obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x=1.5

X	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.0	13.625	24.0	38.875	59.0

14M

UNIT–III

5. Using Euler's Method, find an approximate value of y corresponding to $x=1$, given $\frac{dy}{dx}=x+y$ and $y=1$ when x=0. 14M

OR

6. Use Runge-Kutta method to evaluate $y(0.1)$ and $y(0.2)$ given that $y'=x+y$, $y(0)=1$ 14M

UNIT–IV

7. a) Find the Fourier series expansion for $f(x)=e^x$ in $0<x<2®$ 10M

   b) Form the partial differential equations (by eliminating the arbitrary constants and arbitrary functions) from $z=ax+by+a^2+b^2$ 4M

OR

8. Form the partial differential equation by eliminating arbitrary function from $F\left(x+y+z, x^2+y^2+z^2\right)=0$ 14M

UNIT–V

9. a) Apply C-R conditions to $f(z)=z^2$ and show that the function is analytic everywhere. 7M

b) Evaluate $\int_c \frac{1}{(z-1)(z-3)}dz$ with C: $|z|=2$ using Cauchy's Integral Formula 7M

OR

10. a) Show that $u=\frac{1}{2}\log\left(x^2+y^2\right)$ is harmonic and find its harmonic conjugate function 7M

b) Evaluate $\int_c \frac{\sin^{\circledR} z^2+\cos^{\circledR} z^2}{(z-1)(z-2)}dz$ with C: $|z|=3$ using Cauchy's Integral Formula 7M

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