Hall Ticket Number :										

R-14

Code: 4GC31

II B.Tech. I Semester Supplementary Examinations February 2022

Mathematics-II

(Common to CE & ME)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Test for consistency and solve 5x+3y+7z=4; 3x+26y+2z=9; 7x+2y+10z=5 — 8M

   b) Show that the Eigen values of diagonal matrix are just the diagonal elements of the matrix — 6M

OR

2. a) Determine the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ — 6M

   b) 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. — 8M

UNIT–II

3. a) Find the Cubic polynomial which takes the values. $y(0)=1$, $y(1)=0$, $y(2)=1$ and $y(3)=10$ — 7M

   b) Using Newton-Raphson Method, compute $\sqrt{41}$ correct to four decimal places — 7M

OR

4. Estimate the value of $f(22)$ and $f(42)$ from the following table by Newton's forward and backward interpolation formula. — 14M

x	20	25	30	35	40	45
y	354	332	291	260	231	204

UNIT–III

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

OR

6. Using Picard's process of successive approximation, obtain a solution up to fifth approximation of the equation $\frac{dy}{dx}=x+y$ such that $y=1$ when x=0.Check your answer by finding the exact solution. — 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) Show that the polar form of Cauchy's Riemann equations are $\frac{\partial u}{\partial r}=\frac{1}{r}\frac{\partial v}{\partial \bar{}}, \frac{\partial v}{\partial r}=\frac{1}{r}\frac{\partial u}{\partial \bar{}}$ 7M

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

OR

10. 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

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Hall Ticket Number :										

R-14

Code: 4G531

II B.Tech. I Semester Supplementary Examinations February 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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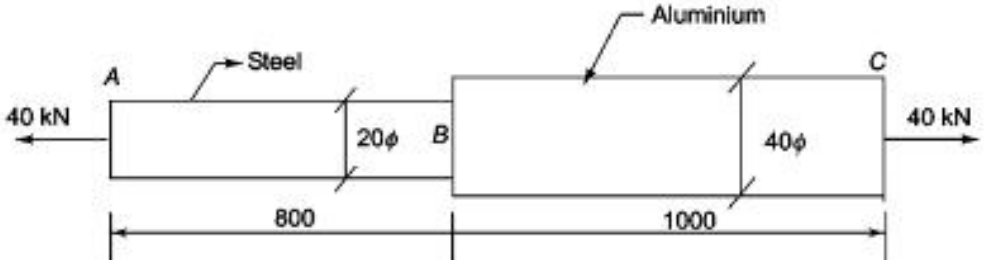
		Marks	CO	Blooms Level

UNIT–I

1. a) Explain various types of stresses and strains. 7M

   b) **A** steel rod, 20 mm diameter and 800 m long, is rigidly attached to an aluminium rod, 40 mm diameter and 1 m long, as shown in Fig. The combination is subjected to a tensile load of 40 kN. Find the stress in the materials and the total elongation of the bar. *E* for steel = 200 GPa, *E* for aluminium = 70 GPa.



7M

OR

2. a) Derive the relationship between young's modulus, modulus of rigidity and bulk modulus. 7M

   b) A bar of 20mm diameter is tested in tension it is observed that when a lead of 40KN is applied the extension measured over a gauge length of 200mm us 0.12mm&contraction in diameter is 0.0036mm. Find poisson's ratio, young's modulus &bulk modulus &v rigidity modulus. 7M

UNIT–II

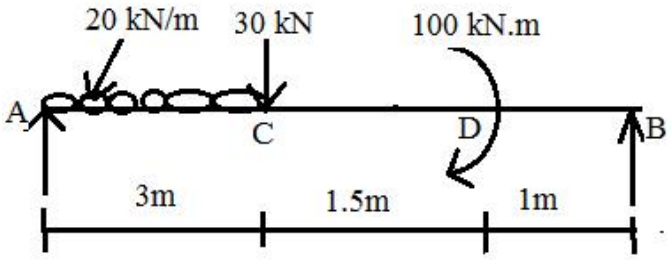
3. a) Define the following :

   i. Bending Moment. ii. Shear force. Iii. Point of contraflexure. 6M

   b) A cantilever of length 2 m carries a 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. 8M

OR

4. Draw shear force and bending moment diagram for the beam shown in Figure



14M

UNIT–III

5. State the assumption in theory of simple bending. And derive the equation

$$\frac{E}{R}=\frac{M}{I}=\frac{f}{y}$$ 14M

OR

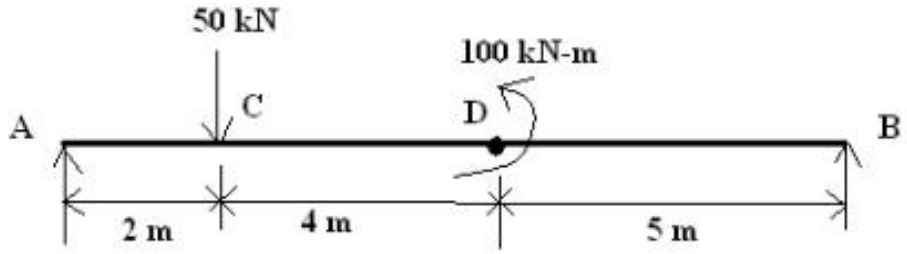
6. a) Derive the section modules for (i) rectangular section and (ii) circular section 6M

   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. 8M

UNIT–IV

7. a) Define Macaulay's method? And find out Deflection of a simply supported beam with an Eccentric point load 7M

   b) A simply supported of 11 m length is loaded as shown in Figure. Determine the deflection under the load at point C and maximum deflection. Take young's modulus as 200 GPa and moment of inertia as 20 x 10^7 mm^4. Use Macaulay's method.



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 x 10^4 N/mm^2. 14M

UNIT–V

9. What are the stresses induced in the thin cylindrical shell subjected to internal pressure? Explain and derive them. 14M

OR

10. A thin cylindrical shell of inside diameter 1.5 m is made of 10 mm thick steel plate. It is of 4 m length and is closed at its both ends. The shell is subjected to an internal fluid pressure of 2 MPa. Determine the change in length, the change in diameter, the change in volume, and circumferential and longitudinal stresses induced in the cylinder. Take modulus of elasticity of the steel is 210 GPa and the Poisson's ratio is 0.3. 14M

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Hall Ticket Number :										

R-14

Code: 4G533

II B.Tech. I Semester Supplementary Examinations February 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

UNIT–I

1. a) Write short notes on (i) Zeroth law of Thermodynamics. (ii) First law of Thermodynamics. 8M
   b) Prove that Internal energy is a property of the system. 6M

OR

2. A stationary mass of gas is compressed without friction from an initial state of $0.3m^3$ and 0.105MPa to a final state of $0.15m^3$ and 0.105MPa. There is a transfer of 37.6KJ of heat from the gas during the process. How much does the internal energy of the gas change? 14M

UNIT–II

3. a) A reversible heat engine operates between a source at 800˚C and sink at 30˚C. What is the least rate of heat rejection per KW network output of the engine? 7M
   b) Bring out the concept of entropy and importance of T-s diagram. 7M

OR

4. a) Derive an expression for Clausius inequality and explain its utility. 10M
   b) Write a short notes on Third law of Thermodynamics 4M

UNIT–III

5. a) Steam enters in an engine at a pressure of 10 bar absolute and 250^0C. It is exhausted at 0.2 bar. The steam exhaust is 0.9dry. Find i) drop in enthalpy ii) Change in entropy 8M
   b) Explain the concept of Triple point. 6M

OR

6. a) Derive an expression for Clausius Clapeyron equation applicable to fusion and Vaporization. 10M
   b) What is a pure substance? 4M

UNIT–IV

7. a) 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. 5M
   b) 0.3 m^3 of air at pressure 8 bar expands to 1.5 m^3. The final pressure is 1.3 bar. Assuming the expansion to be polytropic. Calculate the heat supplied and change of internal energy. Assume γ=1.4 9M

OR

8. a) Explain Vander wall's equation of state and derive the constants for the equation 10M
   b) What is the significance of Vanderwaal's constants : a & b. 4M

UNIT–V

9. a) Write a short note on the Gravimetric Analysis. 7M
   b) Briefly discuss about the Volumetric Analysis. 7M

OR

10. a) The following volumetric composition relate to a mixture of gases: - N_2 = 81%, CO_2=11%, O_2 = 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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