Hall Ticket Number :										

R-15

Code: 5GC31

II B.Tech. I Semester Supplementary Examinations May 2022

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) 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. 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. 14M

UNIT–II

3. a) Find the missing term in the table

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

7M

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

OR

4. a) Find the real root of the equation $x\log_{10}x=1.2$ by Regula-falsi method correct to four decimal places. 7M

   b) Using Lagrange formula find $f(4)$. Given

x	0	2	3	6
y	-4	2	14	158

7M

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. Apply Fourth order Runge-Kutta Method to find an approximate value of y when $x=1.2$ in step of 0.1, given that $y'=x^2+y^2$, $y(1)=1.5$. 14M

UNIT–IV

7. a) Form the partial differential equations (by eliminating the arbitrary constants and arbitrary functions) from $z=ax+by+a^2+b^2$ 5M

b) Find the half range cosine series for the function $f(x)=x$, when $0<x<®$ hence show that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots=\frac{®^2}{8}$ 9M

OR

8. Using the method of separation of variables, solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$ where $u(x,0)=6e^{-3x}$ 14M

UNIT–V

9. a) If $u=x^2+y^2$, find harmonic conjugate $v(x,y)$ and write the corresponding complex potential $f(z)=u+iv$ 7M

b) Show that the polar form of Cauchy's Riemann equations are $\frac{\partial u}{\partial r}=\frac{1}{r}\frac{\partial v}{\partial \_},\frac{\partial v}{\partial r}=\frac{1}{r}\frac{\partial u}{\partial \_}$ 7M

OR

10. Determine p such that the function $f(z)=\frac{1}{2}\log\left(x^2+y^2\right)+i\tan^{-1}\left(\frac{px}{y}\right)$ be an analytic function 14M

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Hall Ticket Number :										

R-15

Code: 5G531

II B.Tech. I Semester Supplementary Examinations May/June 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

UNIT–I

1. a) Define the term 'composite bar'. How will you find the stresses and load carried by each member of a composite bar? 4M

   b) A steel rod 20mm in diameter passes centrally through a steel tube of 25mm internal diameter and 30mm external diameter. The tube is 800m long and is closed by rigid members of negligible thickness which are fastened by nut threaded on the rod. The nuts are tightened until the compressive load on the tube is 20KN. Calculate the stresses in the tube and the rod. 10M

OR

2. a) A steel cube of 30mm external diameter and 20mm internal diameter encloses a copper rod of 15mm diameter to which it is rigidily joined at each ends. If at a temperature of 10°c there is no longitudinal stress. Calculate the stress in the rod and tube when the temperature is raised to 200°c. Take Ec = 1×10^5 Mpa, Es = 2.1×10^5 Mpa, the value of coefficient of linear expansion for steel 11×10^{-6} /°c and for copper 18×10^{-6} /°c respectively. 14M

UNIT–II

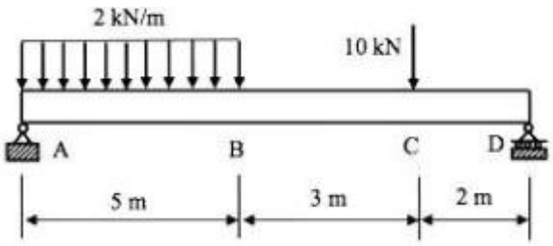
3. a) What are the different types of beams? 4M

   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) Define point of contra flexure. 2M

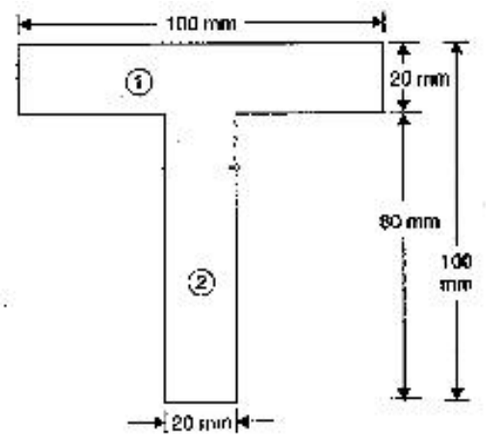
   b) Draw the Shear force and bending moment diagram for the loaded beam as shown in Figure



12M

UNIT–III

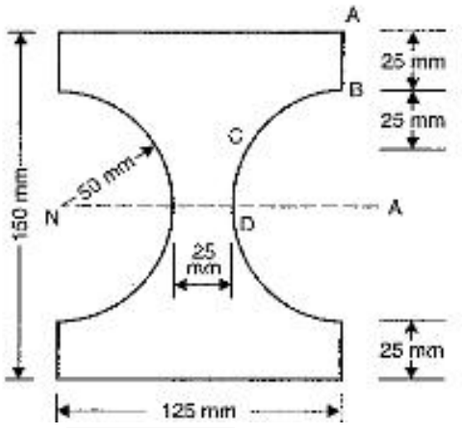
5. A cast iron beam is of T- section as shown in Fig. The beam is simply supported on a span of 10 m. The beam carries a uniformly distributed load of 2 kN/m length on the entire span. Determine the maximum tensile and maximum compressive stresses.



14M

OR

6. Figure shows a section, which is subjected to a shear force of 80 kN. Determine the shear stresses at A, B, C and D. Sketch shear stress distribution also.



14M

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) 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 id 1 x 10^4 N/mm^2., find

   i) The slope at support ends and (ii) maximum deflection 7M

OR

8. A cantilever of 2 m length carries a uniformly varying load of 20 kN/m at the free end to 70 kN/m at the fixed end. If young's modulus is 1 x 10^5 MPa and moment of inertia is 10^8 mm^4, determine the slope and deflection of the cantilever at the free end. 14M

UNIT–V

9. a) Derive the crippling load for a column with one end fixed and the other end free. 7M

   b) A hollow mild steel tube of 6 m long 4 cm internal diameter and 6 mm thick is used as a Sturt with both ends hinged, Find the cripping load and safe load taking factor of safety as 3. Take E = 2 x 10^5 N/mm^2. 7M

OR

10. Determine the maximum and minimum hoop stress across the section of a pipe of 400 mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8 N/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 May/June 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) Derive the general steady flow energy equation and deduce SFEE for Turbine.

   b) A mass of 8 kg gas expands within a flexible container so that the p–v relationship is of the form $pv^{1.2}$ = constant. The initial pressure is 1000 kPa and the initial volume is 1 m^3. The final pressure is 5 kPa. If specific internal energy of the gas decreases by 40 kJ/kg, find the heat transfer in magnitude and direction.

OR

2. a) Classify the types of thermodynamic systems with the help of suitable example.

   b) Identify the differences between open system and closed system in thermodynamics.

UNIT–II

3. a) Discuss about the limitations of First law of Thermodynamics

   b) State Carnot theorem.

OR

4. A reversible heat engine operates between two reservoirs a temperature of 600°C and 40°C. The engine drives a reversible refrigerator which operates between the reservoirs at temperatures of 40°C and -20°C. the heat transfer to the heat engine is 2000 KJ and the network output for the combined engine refrigerator is 30 KJ. Evaluate the heat transfer to the refrigerant and the net heat transfer to the reservoir at 40°C.

UNIT–III

5. a) A sample of steam from a boiler drum at 3 MPa is put through a throttling calorimeter in which the pressure and temperature are found to be 0.1 Mpa, 120°C. Find the quality of the sample taken from the boiler.

   b) Describe with a neat sketch a separating calorimeter for measuring the dryness fraction of steam.

OR

6. A vessel having a capacity of 0.05 m^3 contains a mixture of saturated water and saturated steam at a temperature of 245°C. the mass of the liquid present is 10 kg. Calculate the pressure, mass, specific volume, specific enthalpy, specific entropy, and specific internal energy.

UNIT–IV

7. a) Derive the relationship between the two principal specific heats and characteristic gas constant for a perfect gas

   b) Deduce the equation PV^Y = Constant for an adiabatic process

OR

8. A constant volume chamber of 0.3 m^3 capacity contains 2 kg of this gas at 5^0C. Heat is transferred to the gas until the temperature is100^0C. Find the work done, the heat transferred and the changes in internal energy, enthalpy and entropy.

UNIT–V

9. a) Write about average molar mass of the gas mixture

   b) State Avogadro's law of Additive volumes.

OR

10. A Vessel of 5 m^3 capacity contains two gases A and B in proportion of 40% and 60% respectively at 25^0C .If the value of R for the gases is 0.288 kj/kgK and 0.295 kj/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.

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