Hall Ticket Number :										

R-15

Code: 5G533

II B.Tech. I Semester Supplementary Examinations March 2021

Basic Thermodynamics

(Mechanical Engineering)

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) Discuss about Macroscopic and Microscopic view point of Thermodynamics.
   b) What is meant by displacement work? Explain the same with reference to the Quasi-static process.

OR

2. To a closed system 150 KJ of work is supplied. If the initial volume is 0.6 m^3 and the pressure of the system changes as p=8 - 4V where p is in bar and V is in m^3, determine the final volume and pressure of the system.

UNIT–II

3. a) Write short notes on Second law of Thermodynamics.
   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?

OR

4. Three Carnot Heat Engines HE1, HE2, HE3 are connected in series. They are working with same thermal efficiency. The heat supplied to the entire system is2400 kW and heat rejected from entire system is 300 kW Calculate work done for each engine.

UNIT–III

5. a) Draw and explain P-T diagram for pure substance
   b) Find the specific volume, enthalpy, entropy and internal energy of wet steam at 18 bar, dryness fraction 0.85

OR

6. 1 kg of steam initially dry saturated at 1.1 MPa expands in a cylinder following the law $pV^{1.13} = c$. The pressure at the end of expansion is 0.1 MPa. Determine i) Final volume ii) Final dryness fraction iii) Work done iv) Change in internal energy v) Heat transferred.

UNIT–IV

7. a) Deduce the relationship between absolute temperature and absolute pressure in an adiabatic process.
   b) Explain Throttling process and Free expansion process.

OR

8. 1.5 kg of air at pressure 6 bar occupies a volume of 0.2 m^3. If this air is expanded to a volume of 1.1 m^3. 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.

UNIT–V

9. The volumetric analysis of a dry flue gas in a boiler trail is given in percentage as 13% CO_2, 1.5% CO ,3.5% O_2 and 82% N_2. Determine the percentage gravimetric analysis also find the specific gas constant of the mixture

OR

10. a) A gas mixture consists of 7kg nitrogen and 2kg oxygen, at 4 bar and 27°C. Calculate the mole fraction, partial pressure, molar mass, gas constant, volume and density.
    b) State Avogadro's law of Additive volumes.

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Hall Ticket Number :										

R-15

Code: 5GC31

II B.Tech. I Semester Supplementary Examinations March 2021

Engineering Mathematics-III

(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. Show that the Eigen values of diagonal matrix are just the diagonal elements of the matrix

OR

2. Using Cayley-Hamilton theorem, find A^8, if $A=\begin{bmatrix}1 & 2\\ 2 & -1\end{bmatrix}$

UNIT–II

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

OR

4. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x=1.1 and 1.6 from the following table.

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

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.

OR

6. Apply Milne's method to find a solution of the equation $y'=x-y^2$ in the range $0\le x\le 1$ for the boundary conditions y=0 at x=0.

UNIT–IV

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

OR

8. Form a partial differential equation by eliminating the arbitrary functions from $z=f(x+at)+g(x-at)$

UNIT–V

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

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

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Hall Ticket Number :										

R-15

Code: 5G531

II B.Tech. I Semester Supplementary Examinations March 2021

Mechanics of Solids

(Mechanical Engineering)

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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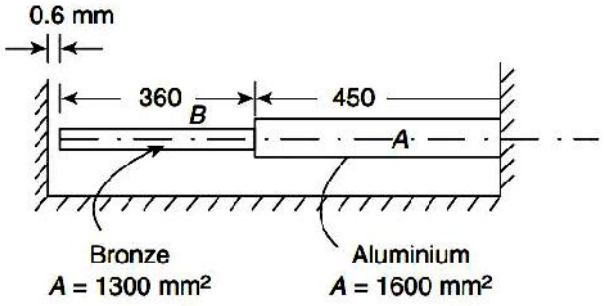
			Marks	CO	Blooms Level

UNIT–I

1. a) A composite bar of bronze and aluminium as shown in the following Fig. The temperature of the composite bar is raised by 100°C. Determine the compressive force developed in the bars after the rise of temperature and the change in length of aluminium bar. The area of cross-section of bronze bar is 1,300 mm2 and of aluminium bar is 1,600 mm2 E_b = 105 GPa, E_a = 70GPa, α_b = 18 × 10−6 /°C, α_a = 23 × 10−6 /°C.



10M CO1 L3

b) A 40-mm cubical block is subjected to shear stress and it is observed that τ_e = 240 N/mm^2. If shear modulus G = 84 kN/mm^2, determine (i) the modulus of resilience, (ii) the shear strain at elastic limit and (iii) the total strain energy absorbed at elastic limit. 4M CO1 L2

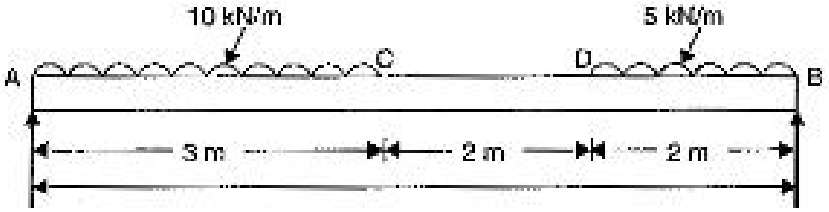
OR

2. a) Draw stress-strain curve for a ductile material subjected to tension and explain about the salient points on it. 5M CO1 L3

b) A tension test is conducted on a steel bar of gauge length 55 mm and diameter 10 mm.The bar during the test elongates to 80 mm.A maximum load of 80 kN may be applied onthe bar but it yields at 35 kN and finally breaks at 40 kN. Find the following parameters.(i) Yield strength; (ii) Ultimate strength; (iii) Strength at the point of failure;(iv) Actual strength at the point of failure when the diameter is reduced to 5 mm;(v) Percentage elongation; and (vi) Percentage reduction in area. 9M CO1 L3

UNIT–II

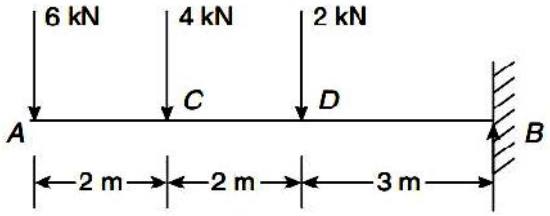
3. A simply supported beam of length 7m, carries the uniformly distributed load and two-point loads as shown in the following Fig. Draw the Shear Force and Bending Moment diagrams for the beam. Also calculate the location and magnitude of maximum bending moment.



14M CO2 L3

OR

4. A 7-m-long cantilever is free at end A and fixed at end B carries three loads as shown in Fig. Determine support reaction and draw SF diagram and BM diagram of the cantilever.



14M CO2 L3

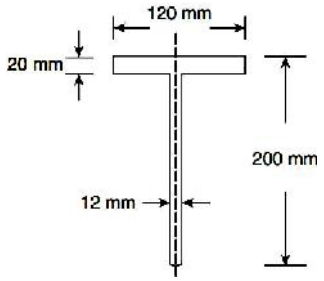
UNIT–III

5. Derive the expression for Shear Stress Distribution in a Rectangular Section of a Beam. 14M CO3 L3

OR

6. a) A beam is of circular sections of diameter D mm. At a particular section of the beam, shear force is 10 kN. Determine the diameter D if the maximum shear stress at neutral layer is not to exceed 15 N/mm^2 . 7M CO3 L3

   b) A T-section with dimensions, flange 120 mm × 20 mm and web 180 mm × 12 mm, is shown in Fig. It is subjected to a positive bending moment of 5 kN m. What are the stresses developed at extreme edges of the section?



7M CO3 L3

UNIT–IV

7. A beam, 7 m long, carries a uniformly distributed load of 20 kN/m, run throughout its length. The beam is supported over a span of 5 m with overhang of 2 m on one side. Determine the slope and deflection at the free end. If E = 200 GPa and I = 802 × 10^4 mm^4 . 14M CO4 L3

OR

8. A beam ABCD, 7 m long hinged at A and roller supported at D carries 7 kN load at B and 4 kN/m udl over BC = 3 m. If EI = 14,000 kN m^2 for the beam, determine the slope at A and deflection at point C. 14M CO4 L3

UNIT–V

9. a) A thin cylindrical shell made of 5-mm-thick steel plate is filled with water under pressure of 3 N/mm^2 . The internal diameter of the cylinder is 200 mm and its length is 1.0 m. Determine the additional volume of the water pumped inside the cylinder to develop the required pressure. Given for steel E = 208 kN/mm^2 and μ = 0.3, and for water K = 2,200 N/mm^2 . 7M CO5 L3

   b) Derive the expression for circumferential and volumetric strain for thin Cylinder Subjected to Internal Pressure p. 7M CO5 L4

OR

10. a) Evaluate the length of a cast iron column of 80 mm in diameter, the Euler's theory is applicable, if σ_c = 550 N/mm^2 for CI and E = 102 kN/mm^2 , the column is hinged at both the ends 7M CO5 L3

    b) Derive Lami's equation for thick cylinders subjected to internal and external pressures. 7M CO5 L4

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Hall Ticket Number :										

R-15

Code: 5G532

II B.Tech. I Semester Supplementary Examinations March 2021

Metallurgy and Material Science

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any *five full* questions by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. What are the methods used for measuring the grain size? Discuss any two of them.

OR

2. Explain the mechanism of Crystallization in pure metals

UNIT–II

3. Write short notes on
   (i) Gibbs phase rule
   (ii) Composition rule
   (iii) Lever rule

OR

4. What is an Invariant reaction? Explain the Invariant reactions that occur in an Iron–Iron carbide(Fe-Fe_3C) diagram

UNIT–III

5. a) Give the classification of steels. Describe the typical applications of low, medium and high carbon steels.
   b) Discuss about Hadfield manganese steels

OR

6. Describe briefly the properties and applications of copper and its alloys

UNIT–IV

7. Explain about stress relieving annealing and full annealing

OR

8. a) What is Normalizing? Explain its purpose
   b) Compare hardening and Tempering processes

UNIT–V

9. Classify composites. Explain about fiber reinforced composites

OR

10. Discuss about particle reinforced composites and fiber reinforced composites

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