Hall Ticket Number :										

R-15

Code: 5G532

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

Mettallurgy and Material Science

(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. What are the methods used for measuring the grain size? Discuss any two of them. 14M

OR

2. Discuss about the classification of Intermediate Alloy Phases 14M

UNIT–II

3. From the data given below for CU-Ni system, plot the equilibrium diagram to scale and label the diagram.

Weight % Ni	0	20	30	60	80	100
Liquidus temperature ^{0}C	1084	1200	1275	1345	1440	1455
Solidus temperature ^{0}C	1084	1165	1235	1310	1380	1455

Answer the following for 70% Ni alloy:

(i)What is the composition of first solid crystallizing out from liquid?

(ii)What is the composition of last solid formed at the end of solidification?

(iii)What are the amounts of solid and liquid at 1360^{0}C 14M

OR

4. Draw a neat sketch of Iron-Iron Carbide (Fe-Fe_3C) diagram and label all important points, lines and phases in it. 14M

UNIT–III

5. a) Discuss about Hadfield manganese steels 7M

   b) What do you understand by Season cracking and how it can be prevented 7M

OR

6. a) Explain the microstructure, properties and applications of Grey cast iron 7M

   b) Discuss about malleable cast iron mentioning its properties and applications 7M

UNIT–IV

7. Explain about stress relieving annealing and full annealing 14M

OR

8. a) Differentiate between Annealing and Normalizing 7M

   b) Differentiate between carburizing and Nitriding 7M

UNIT–V

9. Explain any two methods of manufacture of composites 14M

OR

10. a) Differentiate between acidic and basic OH process 7M

    b) Define powder metallurgy process and applications of powder metallurgy 7M

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Hall Ticket Number :										

R-15

Code: 5G531

II B.Tech. I Semester Supplementary Examinations Nov/Dec 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

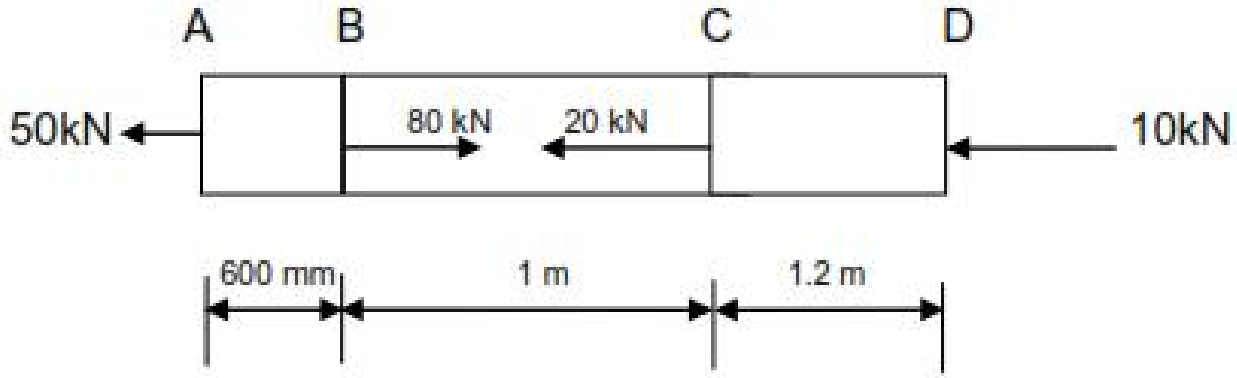
UNIT–I

1. a) 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

OR

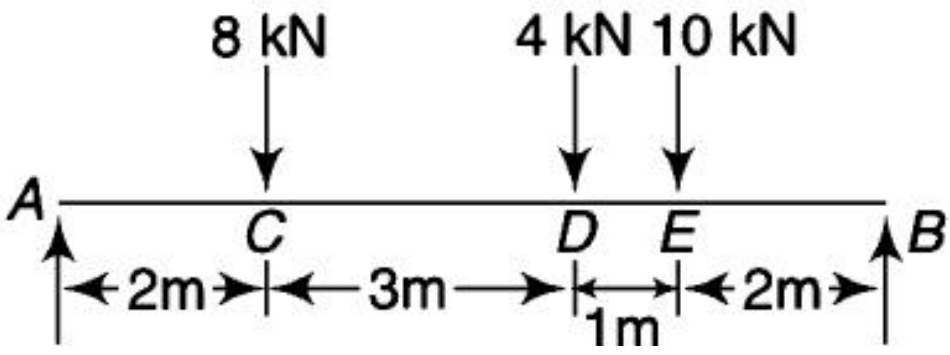
2. A brass bar, having cross-sectional area of 1000 mm^2 is subjected to axial forces as shown in figure. Find the total elongation of the bar.
   Take E=1.05 x 10^5 N/mm^2.



14M

UNIT–II

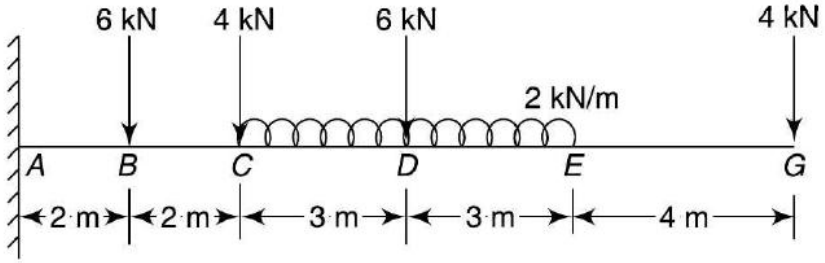
3. Draw the shear force and bending moment diagram for the given beam.



14M

OR

4. Draw the shear force and bending moment diagram for the given beam.



14M

UNIT–III

5. A cast iron beam has an I-section with top flange 80 mm × 40 mm, web 120mm ×20mm and bottom flange 160mm ×40 mm. If the tensile stress is not to exceed 30N/mm^2 and compressive stress 90 N/mm^2, what is the maximum uniformly distributed load the beam can carry over a simply supported span of 6 m if the larger flange is in tension? 14M

OR

6. a) A wooden beam of rectangular section 15 cm x 30 cm is simply supported over a length of 4m. It carries a UDL of 4kN/m throughout its length. What is the maximum shear stress developed in the beam section? 7M

   b) A beam is of a circular section of diameter 80 mm. At particular section SF is 40kN. Draw the shear stress distribution along the depth of the section? 7M

UNIT–IV

7. a) Derive the relationship between slope, deflection and radius of Curvature of a simply supported beam. 7M

   b) A beam of 6 meter long simply supported at its ends, carries a point load 'W' at its centre. If the slope at the ends of the beam is not to exceed 1^0, find the maximum deflection. 7M

OR

8. A cantilever beam of span 2 m supports a UDL of 2 kN/m over a length of 1 m from the fixed end and a point load of 1 kN at 1 m from the free end. Find the slope and deflection at the free end if EI=$1.4 \times 10^3 \text{KN/m}^2$. 14M

UNIT–V

9. State and explain Lame's theory for thick cylindrical shells. Derive the Lame's equations. 14M

OR

10. Determine the ratio of buckling strengths of two columns one hollow and the other solid. Both are made of the same material and have the same length, cross sectional area and end conditions. The internal diameter of hollow column is 2/3rd of its external diameter. 14M

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Hall Ticket Number :										

R-15

Code: 5G533

II B.Tech. I Semester Supplementary Examinations Nov/Dec 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) Explain Quasi-static reversible process with the help of a suitable example. 7M

   b) A mass of gas is compressed in a quasi-static process from 80 kPa, 0.1 m^3 to 0.4 MPa, 0.03m^3. Assuming that the pressure and volume are related by pv^n = constant, find the work done by the gas system. 7M

OR

2. 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

UNIT–II

3. Prove Maxwell Equations and derive two Tds equations 14M

OR

4. A reversible heat engine operates between two reservoirs at temperatures700°C and 50°C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 50°C and – 25°C. The heat transfer to the engine is 2500 kJ and the network output of the combined engine refrigerator plant is 400 kJ. (i) Determine the heat transfer to the refrigerant and the net heat transfer to the reservoir at 50°C; (ii) Reconsider (i) given that the efficiency of the heat engine and the C.O.P. of the refrigerator are each 45 per cent of their maximum possible values. 14M

UNIT–III

5. a) What is a pure substance? Draw and explain P-T diagram for pure substance. 6M

   b) Find the internal energy and enthalpy of unit mass of steam of a pressure of 7 bar when (i) Its quality is 0.8.(ii) it is dry saturated. (iii)Superheated the degree of superheat being 65 ^{0}C. 8M

OR

6. a) Derive Clausius–Clapeyron equation. 7M

   b) Draw a neat sketch of throttling calorimeter and explain how dryness fraction of steam is determined; clearly explain its limitations. 7M

UNIT–IV

7. a) Explain Vander wall's equation of state and derive the constants for the equation. 14M

OR

8. a) 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 7M

   b) Derive the expressions for heat transfer and work done during a reversible isothermal process. 7M

UNIT–V

9. a) The following volumetric composition relate to a mixture of gases: - N2=81%, CO2=11%, O2=6%, CO=2% Determine i) the gravimetric composition. ii) Molecular weight and iii) Universal gas constant R for the mixture. 10M

   b) Explain briefly about Dalton's law of partial pressures. 4M

OR

10. a) Write a short note on the Gravimetric Analysis. 7M

    b) State Avogadro's law of Additive volumes. 7M

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Hall Ticket Number :										

R-15

Code: 5GC31

II B.Tech. I Semester Supplementary Examinations Nov/Dec 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) Show that the Eigen values of diagonal matrix are just the diagonal elements of the matrix 7M

   b) Determine the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ 7M

OR

2. a) 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

   b) Solve the equations x+2y+3z=0;3x+4y+4z=0;7x+10y+12z=0 7M

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

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

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) 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. a) Form a partial differential equation by eliminating the arbitrary functions from $z = f(x+at)+g(x-at)$ 7M

   b) Obtain the Fourier series for $f(x)=x$ in the interval $-® < x < ®$ 7M

UNIT–V

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

   b) Using Cauchy's Integral Formula $\int_c \frac{\sin^2 z}{\left(z-\frac{®}{6}\right)^3}dz$ Evaluate where C is Unit Circle. 7M

OR

10. If $f(z)$ regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ 14M

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