Hall Ticket No | | | | | | | | | | | Question Paper Code: AMEB11

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER- II

B.Tech IV Semester End Examinations, May– 2020

Regulations: IARE-R18

MATERIALS AND MECHANICS OF SOLIDS

(MECHANICAL ENGINEERING**)**

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each Module
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1.	a)	Write the relation between a,b,c and α,β,γ in cubic crystal system, tetragonal crystal system, orthorhombic crystal system and Hexagonal crystal system.	**[7M]**
	b)	What is linear atomic density? Calculate the linear atomic density in [110] direction in the cooper crystal lattice in atoms per mm. copper is FCC and has a lattice constant of 0.351.	**[7M]**
2.	a)	What is the relation between lattice constant (a) and atomic radius(r) in SC structure, FCC structure, BCC structure, HCP structure?	**[7M]**
	b)	Draw the miller indices for (i)(100) (ii)(110)(iii)(111).	**[7M]**

MODULE – II

3.	a)	Explain with the help of a diagram the cooling curve of pure metals.	**[7M]**
	b)	Describe with the help of a diagram the cooling curve of alloys.	**[7M]**
4.	a)	Explain the phase change in a eutectic system with an example.	**[7M]**
	b)	Write a brief note about eutectic system.	**[7M]**

MODULE – III

5.	a)	Derive an expression for total elongation of a uniformly tapering circular section.	**[7M]**
	b)	A circular alloy bar 2 m long uniformly tapers from 30 mm diameter to 20 mm diameter. Calculate the elongation of the rod under an axial force of 50 KN. Take E for the alloy as 140 GPa.	**[7M]**
6.	a)	Determine the young's modulus and Passion's ratio of a metallic bar of length 25cm breadth 3cm depth 2cm when the beam is subjected to an axial compressive load 240KN. The decrease in length is given by 0.05cm and increase in breath 0.002.	**[7M]**
	b)	The extension in a rectangular steel bar of length 400mm and thickness 10mm, is found to be 0.21mm.The bar tapers uniformly in width from 100mm to 50mm. If E for the bar is 2x105 N/mm^2, determine the axial tensile load on the bar	**[7M]**

MODULE – IV

7.	a)	A cantilever beam AB, 1.8 m long carries a point load of 2.5 KN at its free end and a uniformly distributed load of 1KN/m from A to B. Draw shear force and bending	[**7M]**

moment diagrams for the beam.

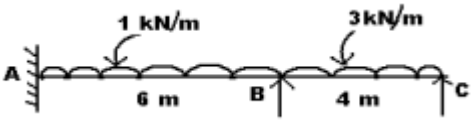
b) A simply supported beam of 3 m span carries two loads of 5 KN each at 1 m and 2 m from the left hand support. Draw shear force and bending moment diagrams for the beam. **[7M]**

8. a) A beam of length 6m is simply supported at it's ends, It is loaded with gradually varying load of 10KN/m from left support 750KN/m to right support then draw the shear force and bending moment diagrams for beam. **[7M]**

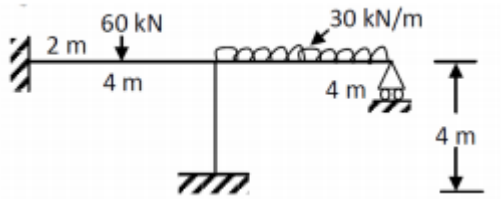
b) Define and explain the following terms **[7M]**
i) Shear force ii) Bending moment iii) Shear force diagram
iv) Bending moment diagram

MODULE – V

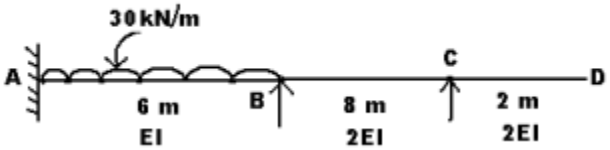
9. a) Analyze the continuous beam ABC shown in figure by slope deflection method and sketch the bending moment diagram. Take EI = constant. **[7M]**



b) Analyze the frame shown in figure by slope deflection method. Draw BMD flexural rigidity is same for all members **[7M]**



10. a) Using slope deflection method, analyze the beam shown in figure and draw the BMD. **[7M]**



b) Write down the general slope deflection equations and state what each term represents. **[7M]**

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COURSE OBJECTIVES:

I	Understand the basic structure and crystal arrangement of materials.
II	Knowledge of phase diagrams and equilibrium diagrams.
III	Understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams, shafts, cylinders and spheres for various types of simple loads.
IV	Calculate the slope and deflection of different types of beams.

COURSE OUTCOMES:

S. No.	Description	Blooms Taxonomy Level
AMEB11.01	Understand the concepts crystallography, crystal structures, unit cells, crystallographic planes, directions and miller indices.	Remember
AMEB11.02	Discuss the crystal imperfections and Frank Reed source of dislocation.	Understand
AMEB11.03	Demonstrate the concept of Bauschinger"s effect, twinning, strain hardening and seasons cracking.	Remember
AMEB11.04	Knowledge of yield point phenomenon, cold/hot working, recovery, re-crystallization, grain growth and strengthening of metals.	Understand
AMEB11.05	Discuss the constitution of alloys and phase diagrams, constitution of alloys, solid solutions, substitutional and interstitial.	Remember
AMEB11.06	Demonstrate the phase diagrams, isomorphous, eutectic, peritectic, eutectoid and peritectoid reactions.	Understand
AMEB11.07	Construction of iron –Iron carbide equilibrium diagram.	Remember
AMEB11.08	Classification of steel and cast-Iron microstructure, properties and application.	Understand
AMEB11.09	Discuss Hooke's law, stresses and strains	Remember
AMEB11.10	Derive relationship between elastic constants.	Understand
AMEB11.11	Describe the concept of poisson's ratio, linear and lateral strains.	Remember
AMEB11.12	Construct the Mohr's circle to solve principal stresses and strains.	Understand
AMEB11.13	Understand the beams and types transverse loading on beams, shear force and bend moment diagrams.	Remember
AMEB11.14	Discuss types of beam supports, simply supported and over-hanging beams, cantilevers.	Understand
AMEB11.15	Understand theory of bending of beams, bending stress distribution and neutral axis.	Remember
AMEB11.16	Understand the shear stress distribution, point and distributed loads.	Remember
AMEB11.17	Understand moment of inertia about an axis and polar moment of inertia.	Understand

AMEB11.18	Derive the deflection of a beam using double integration Method.	Remember
AMEB11.19	Computation of slopes and deflection in beams.	Understand
AMEB11.20	Discuss Maxwell‟s reciprocal theorems.	Remember

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DEPARTMENT OF MECHANICAL ENGINEERING

MAPPING OF MODEL QUESTION PAPER QUESTIONS TO THE ACHIEVEMENT OF COURSE OUTCOMES

SEE Question No.		Course Outcomes		Blooms Taxonomy
1	a	AMEB11.01	Understand the concepts crystallography, crystal structures, unit cells, crystallographic planes, directions and miller indices.	Remember
	b	AMEB11.01	Discuss the crystal imperfections and Frank Reed source of dislocation.	Understand
2	a	AMEB11.02	Demonstrate the concept of Bauschinger‟s effect, twinning, strain hardening and seasons cracking.	Remember
	b	AMEB11.03	Knowledge of yield point phenomenon, cold/hot working, recovery, re-crystallization, grain growth and strengthening of metals.	Understand
3	a	AMEB11.04	Discuss the constitution of alloys and phase diagrams, constitution of alloys, solid solutions, substitutional and interstitial.	Remember
	b	AMEB11.04	Demonstrate the phase diagrams, isomorphous, eutectic, peritectic, eutectoid and peritectoid reactions.	Understand
4	a	AMEB11.04	Construction of iron –Iron carbide equilibrium diagram.	Remember
	b	AMEB11.04	Classification of steel and cast-Iron microstructure, properties and application.	Understand
5	a	AMEB11.05	Discuss Hooke’s law, stresses and strains	Remember
	b	AMEB11.05	Derive relationship between elastic constants.	Understand
6	a	AMEB11.06	Describe the concept of poisson’s ratio, linear and lateral strains.	Remember
	b	AMEB11.06	Construct the Mohr’s circle to solve principal stresses and strains.	Understand
7	a	AMEB11.07	Understand the beams and types transverse loading on beams, shear force and bend moment diagrams.	Remember
	b	AMEB11.07	Discuss types of beam supports, simply supported and over-hanging beams, cantilevers.	Understand
8	a	AMEB11.08	Understand theory of bending of beams, bending stress distribution and neutral axis.	Remember
	b	AMEB11.08	Understand the shear stress distribution, point and distributed loads.	Understand
9	a	AMEB11.09	Understand moment of inertia about an axis and polar moment of inertia.	Remember
	b	AMEB11.10	Derive the deflection of a beam using double integration Method.	Understand
10	a	AMEB11.11	Computation of slopes and deflection in beams.	Remember
	b	AMEB11.12	Discuss Maxwell‟s reciprocal theorems.	Understand

Signature of Course Coordinator

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HOD, M.E