C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 53103

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Third Semester

Civil Engineering

15UCE303 - MECHANICS OF SOLIDS - I

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. What will be the Poisson's ratio, if bulk modulus is K and modulus of rigidity is G? CO1-U

   (a) $\frac{3K+2G}{6K-2G}$ (b) $\frac{3K-2G}{6K+2G}$ (c) $\frac{3K+4G}{6K-4G}$ (d) $\frac{3K-4G}{6K+4G}$

2. If Cross section of a bar is subjected to an uniaxial tensile stress p, then tangential stress on a plane inclined at Θ to the Cross section of the bar is CO2-U

   (a) psin θ (b) p $\frac{cos2\theta}{2}$ (c) p $cos2\theta$ (d) p $\frac{sin2\theta}{2}$

3. Which equation is used to find out the frame is perfect? CO3-R

   (a) m=j-3 (b) m=3j-3 (c) m=2j-3 (d) m=2j-4

4. The material that exhibits the same elastic properties in all the directions at a point is called CO4-U

   (a) Homogeneous (b) Orthotropic (c) Isotropic (d) Visco-elastic

5. Helix angle of open coiled helical spring is CO5-R

   (a) $<10^o$ (b) $>10^o$ (c) $<15^o$ (d) $>15^o$

PART – B (5 x 3= 15 Marks)

6.	Define Hooke's law	CO1-R
7.	What is the use of mohr's circle?	CO2-U
8.	List the methods to find member forces of a truss.	CO3-R
9.	Write the assumptions in the theory of simple bending	CO4-U
10.	Write down the expression for torque transmitted by hollow shaft	CO5-R

PART – C (5 x 16= 80 Marks)

11.	(a)	A square bar of material of cross section 40mm x 40mm is subjected to an axial pull of 160kN. The measured extension on a gauge length of 200mm is 0.1mm and decrease in each side of the square bar is 0.005mm. calculate the modulus of elasticity, shear modulus and bulk modulus of the material.	CO1-App	(16)
		Or		
	(b)	A solid Cyldrical brass bar of 25mm diameter is enclosed in a steel tube of 50mm external diameter and 25mm internal diameter. The bar and the tube are both initially 1.5m long and are rigidly fastened at both ends. Find the stresses induced in the two materials when the assembly is subjected to an increase in temperature of 50^{o}c. take coefficient of thermal expansion of steel as $12x10^{-6}/^{o}$c and that of brass as $18x10^{-6}/^{o}$c. modulus of elasticity of steel as $2x10^{5}N/mm^{2}$ and modulus of elasticity of brass as $1x10^{5}N/mm^{2}$	CO1-App	(16)
12.	(a)	The principal stresses in the wall of a container are $40MN/m^{2}$ and $80MN/m^{2}$. Determine the normal, shear and resultant stresses in magnitude and direction in a plane, the normal of which makes an angle of 30^{o} with the direction of maximum principal stress.	CO2-App	(16)
		Or		
	(b)	At a point in the web of a girder the bending stress is $60N/mm^{2}$ tensile and the shearing stress at the same point is $30N/mm^{2}$. Determine (i) the principal stresses and principal planes. (ii) Maximum shear stress and its orientations.	CO2-App	(16)

13. (a) Analyze the simply supported truss as shown in Fig.1 by method of joints CO3-App (16)

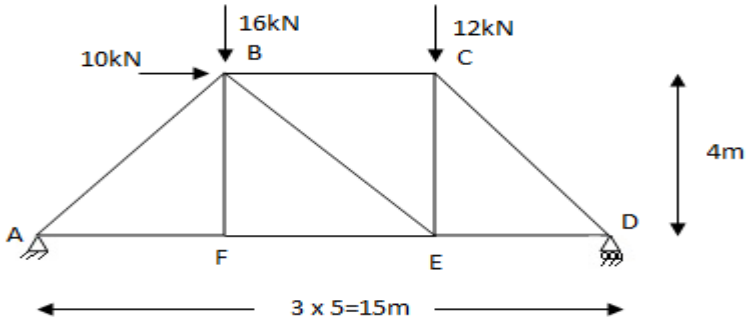

Figure.1

Or

(b) Analyze the truss shown in Fig.2 by method of sections. CO3-App (16)

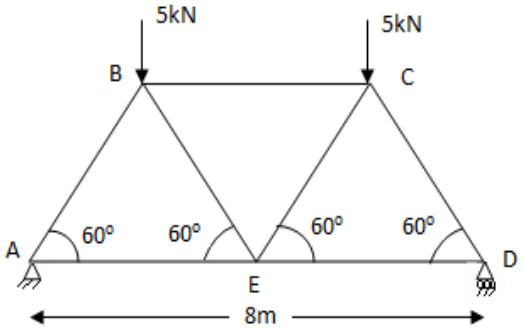

Figure.2

14. (a) Draw the shear force and bending moment diagrams for the beam shown in Fig.3. Also mark the positions of the maximum bending moment and determine its magnitude. CO4-App (16)

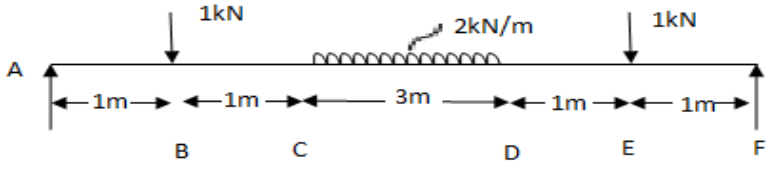

Figure.3

Or

(b) A channel section made with 120mmx10mm horizontal flanges and 160mmx10mm vertical web is subjected to a shear force of 120kN. Draw the shear stress distribution diagram across the section. CO4-App (16)

15. (a) An open coiled helical spring made of 10mm diameter wire and mean diameter 100mm ϕ as 12 coils, angel of helix being 15 degrees. Determine the axial deflection and the intensities of bending and shear stress under a load of 500N. Take C as $80kN/mm^2$ and $E=200kN/mm^2$. CO5-App (16)

Or

(b) A circular shaft is required to transmit a power of 220kw at 200rpm. The maximum torque may be 1.5 times the mean torque and the shear stress in the shaft not to exceed $50N/mm^2$. Determine the diameter
(i) the shaft is solid
(ii) the shaft is hollow with external diameter is twice the internal diameter. Take modulus of rigidity as $80kN/mm^2$. CO5-App (16)