

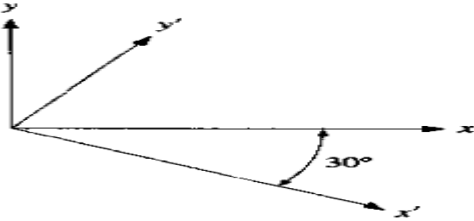
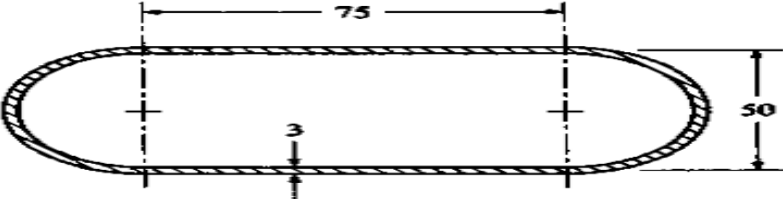


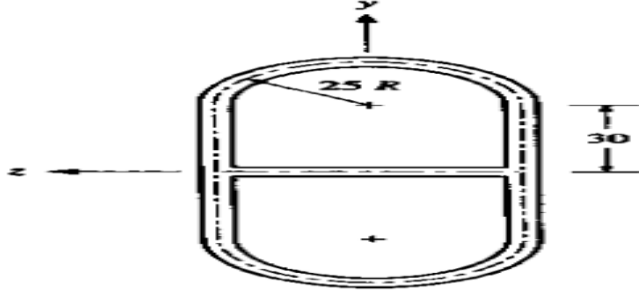
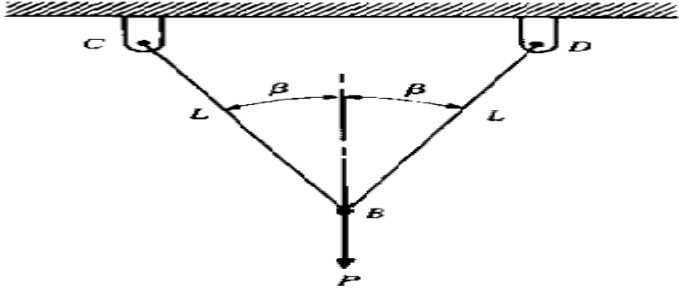
End Semester Examination – Nov/Dec – 2016

Code : 14ME3008
Sub.Name : Advanced Strength of Materials

Semester : 2016-17 ODD
Duration : 3hrs
Max. marks : 100

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	<p>A point is undergoing plane stress and relative to the xyz and x'y'z' systems $\sigma_x = 40$, $\sigma_y = -30$, $\tau_{xy} = -20$ MPa. Determine $\sigma_{x'}$, $\sigma_{y'}$ and $\tau_{x'y'}$.</p> 	CO1	20
(OR)				
2.	a.	<p>The stress at a point relative to an xyz coordinate system is</p> $[\sigma] = \begin{bmatrix} 6 & 4 & 0 \\ 4 & -3 & 0 \\ 0 & 0 & 3 \end{bmatrix} \text{ MPa}$ <p>Determine the normal and shear stresses on a surface whose outer normal has the directional cosines $n_x = n_y = 6/11$ and $n_z = 7/11$</p>	CO1	20
3.	a.	<p>Determine the stress fields that arise from the following stress functions</p> <p>a) $\Phi = Ax + Cy^3$ b) $\Phi = Axy^2 + By + Cxy^3 + D$ c) $\Phi = Ax^2 + Bx^2y^3 + Cxy^3 + Dxy^3$</p>	CO2	12
	b.	<p>A solid circular shaft of radius r_o is transmitting a torque T. Determine the corresponding shear-stress distribution.</p>	CO2	8
(OR)				
4.	a.	<p>Consider the equilateral cross section with sides of length 2 cm. Determine the shear stress distribution if the section is transmitting a torque T of 30 kN.m.</p>	CO2	20
5.	a.	<p>A thin walled steel tube, 1 m long, with the cross section as shown is transmitting a torque of 2 kN.m. The 50 mm dimension is between wall centers. For the material let young's modulus be 210 GPa and Poisson's ratio is 0.29. Determine the average shear stress in the wall and the total angle of twist of the tube.</p> 	CO3	14
All dimensions in mm				

	b.	The cross section of a shaft is a thin walled rectangle with dimension 6 cm X 2 cm with uniform wall thickness of 2 mm. Estimate the shear stress in each wall.	CO3	6
(OR)				
6.	a.	<p>A thin walled, two cell aluminium tube, symmetric with the y and z axes is transmitting a torsional moment of 2.5 kN.m. The thickness of each wall is 5 mm. For aluminium let young's modulus be 70 GPa and Poisson's ratio be 0.33. Determine the average shear stress in each wall and angle of twist per unit length.</p>  <p style="text-align: center;">All dimensions in mm</p>	CO3	20
7.	a.	<p>Determine the vertical deflection of a point B of the structure shown in figure below. Members BC and BD have equal length $L = 10$ mm, area $A = 20$ mm² and modulus $E = 210$ GPa.</p> 	CO4	20
(OR)				
8.	a.	<p>At a point the state of stress is given by stress matrix</p> $[\sigma] = \begin{bmatrix} 30 & -15 & 20 \\ -15 & -25 & 10 \\ 20 & 10 & 40 \end{bmatrix} \text{ MPa}$ <p>Determine the strain energy per unit volume if young's modulus is 70 GPa and Poisson's ratio 0.33.</p>	CO4	20
Compulsory:				
9.	a.	Write short notes on stress concentration factor.	CO4	10
	b.	Estimate the life of a steel fatigue specimen of diameter $1/3^{\text{rd}}$ of the length with a force 100 N. The material has an ultimate strength twice of endurance limit. The length of specimen is 60 cm and endurance limit is 50 MPa.	CO4	10

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