

Reg.No. _____



Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

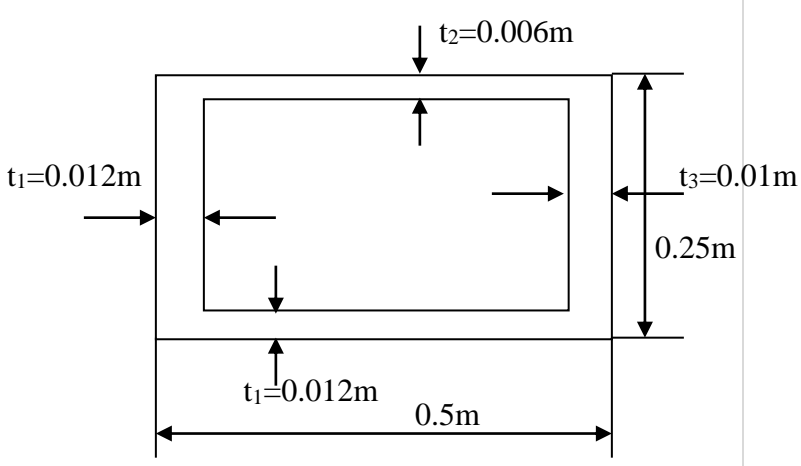
End Semester Examination – Nov/Dec – 2016

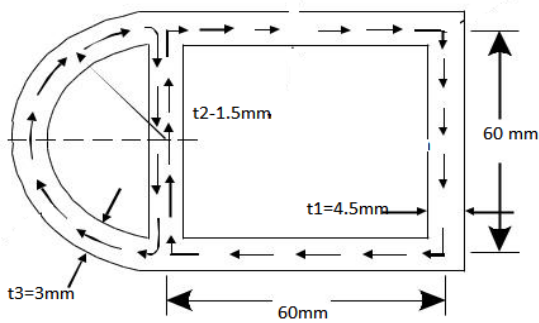
Code : **14CE3001**
Sub. Name : **Applied Elasticity and Plasticity**

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	Explain Generalized Hook's Law.	1	5
	B	Explain St.Venant's compatibility equations?	1	5
	C	The state of stress at a particular point relative to the xyz coordinate system is given by the stress matrix	1	10
	.	$\begin{bmatrix} 100 & -80 & 40 \\ -80 & 180 & 60 \\ 40 & -60 & 150 \end{bmatrix} \text{ MPa}$ <p>(i) Find the stress invariants (ii) Find the normal stress, shear stress and resultant stress on octahedral plane (iii) Also find principal stresses</p>		
(OR)				
2.	A	Explain displacement formulation of elasticity problems	1	5
	B	The strain field in a body is given by	1	5
		$\begin{aligned} \epsilon_{xx} &= 0.005z & \gamma_{xy} &= 0.003xy \\ \epsilon_{yy} &= 0.001x & \gamma_{yz} &= -0.001xz \\ \epsilon_{zz} &= -0.002xy & \gamma_{zx} &= 0.001y \end{aligned}$ <p>Check whether it is a compatible strain field</p>		
	C	The state of stress at a particular point relative to the xyz coordinate system is given by the stress matrix	1	10
		$\begin{bmatrix} 20 & -30 & -20 \\ -30 & 60 & 50 \\ -20 & 50 & 75 \end{bmatrix} \text{ MPa}$ <p>Determine the normal stress, shear stress and its directions on a plane which is equally inclined to the coordinate directions.</p>		
3.	A	Explain plane stress problem with examples.	1	5
	B	Explain Airy's stress function.	1	5

	C	<p>Show that the following function is acceptable stress function and investigate what problem it solves when applied to the region bounded in $y = 0, y = \pm c, x = 0$ on the side $x + ve$.</p> $\phi = (q/8c^3)[x^2(y^3 - 3c^2y + 2c^3) - (1/5)(y^3(y^2 - 2c^2))]$	1	10
(OR)				
4.	A	Explain Plane strain problem with examples	1	5
	B	<p>For a plane stress problem, derive</p> $G \nabla^2 u + \frac{E}{2(1-\gamma)} \frac{\partial}{\partial x} \left\{ \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right\} + Bx = 0$ <p>and a companion equation</p>	1	5
	C	<p>Investigate what problem of plane stress is solved by the stress function, 6.</p> $\phi = \frac{-F}{d^3} xy^2 (3d - 2y)$ <p>applied to the region bounded in $y = 0, y = d, x = 0$ on the side $x + ve$.</p>	1	10
5.	A	Develop the differential equations of equilibrium in polar co-ordinates.	1	10
	B	Develop the stress distribution in an infinite plate with a hole and subjected to uniform pressure and prove that the stress concentration factor is 3	1	10
(OR)				
6.	A	A thick cylinder which has an inner diameter of 1 meter is subjected to internal fluid pressure of 10MPa. Calculate the wall thickness if the maximum stress is not to exceed 40MPa	1	10
	B	Determine the stress distribution in a curved bar subjected to pure bending	1	10
7.	A	Develop Bredt Batho theory of torsion of thin walled closed sections.	1	5
	B	<p>Derive the expression for angle of twist and shear stress for a thin walled closed non-circular section due to twisting moment and hence determine the shear stress and angle of twist for a hollow thin walled aluminum tube of rectangular cross section as shown in Fig subjected to a torque of 56.5kNm. Assume $G = 28\text{Gpa}$</p> 	1	5

	C	Develop the expression for maximum shear stress and unit angle of twist for a equilateral triangular shaft subjected to torque.	1	10
(OR)				
8.	A	Explain Poisson's Equation and the associated boundary conditions for torsion of non -circular section.	1	5
	B	Explain Prandtl Membrane Analogy for analyzing torsion of non-circular section?	1	5
	C	A two cell tube shown in Figure is subjected to a torque 10kN.m. determine the shearstress in each part and angle of twist per metre length. Take $G=80$ GPa.	1	10
				
Compulsory:				
9.	A	A rectangular beam 8 cm wide and 10 cm deep is 200 cm long and is simply supported at the ends. The yield strength for the beam material is 250 MPa. Determine the value of the concentrated load applied at the beam midspan if (i) the outermost fibers of the beam just start yielding, (ii) the outer shell upto 3 cm depth yields and (iii) whole of the beam yields. Assume linear idealized stress strain curve for the beam materials.\	1	10
	B	<p>A thick cylinder of internal radius 15 cm and external radius 25 cm is subjected to an internal pressure” p” MPa. . If the yield stress for the cylinder material is 220 N/mm^2, determine the following</p> <ul style="list-style-type: none"> (i) The pressure at which the cylinder will start yielding just at the inner surface (ii) The stresses when the cylinder has a plastic front radius of 20 cm and (iii) The stresses when the entire cylinder has yielded · <p>Assume Von-Mises yield condition and a state of plane strain</p>	1	10