Registration no:

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B.Tech

PCCI4303

5th Semester Back Examination 2017-18
Advance Mechanics of Materials
BRANCH: Civil
Time: 3 Hours
Max Marks: 70
Q.CODE: B219
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**
- **a)** What is strain energy theory?
- **b)** Differentiate: repeated stress and completely reverse stress
- **c)** Define is shear centre.
- **d)** Write down the advantage of compounding thick cylinder.
- **e)** State and explain Castigliano's theorem.
- **f)** What is neutral axis in bending?
- **g)** What is notch sensitivity
- **h)** Why the trapezoidal cross-section of a crane hook is preferred over a rectangular cross-section?
- **i)** What is stress concentration?
- **j)** What is endurance limit?

Q2 **a)** What are the stress invariants and strain invariants? Explain. **(5)**
   b) Given a state of stresses at a point with respect to a convenient coordinate system (x , y , z) be σ_x = 100 MPa , σ_y = −60 MPa , , σ_z = 40 MPa, τ_{xy} = 80 MPa, τ_{yz} = τ_{zx}= 0 MPa. Determine **(5)**
    (a) the principal normal stresses and the direction.
    (b) the principal shear stresses.

Q3 **a)** Derive an expression for deflection of a cantilever beam of uniform cross-section is loaded by concentrated force acts its free end. **(5)**
   b) Explain the maximum distortion energy theory. **(5)**

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Q4 **a)** Derive the Lame's equation. **(5)**

b) Calculate the thickness of metal necessary for cylinder shell of internal diameter 160 mm to withstand an internal pressure of 25 MN/m^2, if maximum permissible tensile stress is 125 MN/m^2. **(5)**

Q5 **a)** Data taken from a rectangular rosette as shown below. **(5)**
ε_0= 750μ, ε_{45}= -110μ, ε_{90}= 210μ and E value is 200 kN/mm^2 and poison's ratio (γ) is 0.3 for the material.
Find out the principal strains and corresponding principal stresses.

b) Derive the differential equations of equilibrium in three dimensions. **(5)**

Q6 **a)** What do you mean by compatibility equations? What is its physical significance? **(5)**

b) Find out the equation of elastic strain energy due to bending moment. **(5)**

Q7 Derive the formula for bending stress of a curved beam having rectangular cross-section. **(10)**

Q8 **Write short answer on any TWO:** **(5 x 2)**
a) Octahedral shear stress theory
b) Plane stress and plane strain condition.
c) Stress optic law
d) Resistance strain gauges