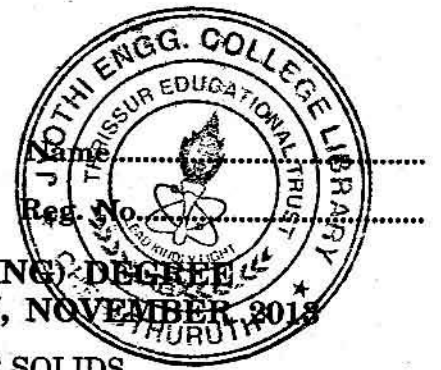


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**FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE  
(REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2018**

**ME 09 502—ADVANCED MECHANICS OF SOLIDS**

Time : Three Hours

Maximum : 70 Marks

**Part A**

*Answer all questions.*

- I. (a) Define Principal stresses.  
(b) Define Strain at a point.  
(c) Define Plane strain.  
(d) Define Shear center.  
(e) What is meant by membrane analogy ?

(5 × 2 = 10 marks)

**Part B**

*Answer any four questions.*

- II. (a) Explain generalized Hooke's law.  
(b) Explain uniqueness theorem.  
(c) Explain Lamé's stress ellipsoid.  
(d) What do you understand by principle of virtual work ?  
(e) Explain warping of non-circular shaft.  
(f) Explain maxwell reciprocal theorem.

(4 × 5 = 20 marks)

**Part C**

*Answer all questions.*

- III. (a) Using conditions of compatibility, check whether the following system of plane strains is possible or not

$$\epsilon_x = 5 + x^2 + y^2 + x^4 + y^4$$

$$\epsilon_y = 6 + 3x^2 + 3y^2 + x^4 + y^4$$

$$\tau_{xy} = 10 + 4xy(x^2 + y^2 + z).$$

Or

- (b) Derive displacement equations of equilibrium.

(10 marks)

Turn over

IV. (a) Derive the equilibrium equations in polar co-ordinates.

*Or*

(b) Analyse the stress function  $\phi = Ax^2y$  in terms of Airy's stress function.

(10 marks)

V. (a) Locate the shear centre for a channel section.

*Or*

(b) A simply supported beam carries a concentrated load  $W$  at its center and a u.d.l.  $w/m$  on the whole span. Using Castigliano's second theorem, find the deflection at the center. Take the span as  $L$  and stiffness as  $EI$ .

(10 marks)

VI. (a) Using two dimensional Laplace equations solve for the torsional equations for an elliptical bar.

*Or*

(b) In what way Prandtl's formulation for the torsion problem is superior to St. Venant's formulation? Explain this by an example.

(10 marks)

[4 × 10 = 40 marks]