

Roll No.
(01/21-1)

11710

M. Sc. (5 Years) EXAMINATION

(For Batch 2018 & Onwards)

(Ninth Semester)

MATHEMATICS

MTHCC-5906

Advanced Mechanics of Solids

Time : Three Hours Maximum Marks : 70

Note : Attempt Five questions in all, selecting one question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) Define plane stress.
- (b) Define lines of shearing stress.
- (c) Define stress function in torsion problem.

- (d) Explain deflection of elastic string.
- (e) Write a short note on Galerkin method.
- (f) Define spring and dashpot.
- (g) Explain creep and relaxation phenomena.

Unit I

2. (a) Explain generalized plane stress.
- (b) Derive general solution of biharmonic equation.
3. (a) Derive stresses and displacements in terms of $\phi(z)$ and $\chi(z)$.
- (b) Derive displacement and stresses of a thick-walled tube under external and internal pressure.

Unit II

4. Find the displacement components in case of an elastic beam stretched by its own weight.
5. (a) Derive Neumann's problem.

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- (b) Show that maximum shearing stress occurs on the boundary of the cross-section.

Unit III

6. (a) State and prove theorem of minimum potential energy.
(b) Explain deflection of an elastic membrane.
7. Explain methods of Kantorovich in 2-D and solve the B.V.P :

$$\nabla^2 \psi = -2 \quad \text{in } R$$

$$\psi = 0 \quad \text{in } C$$

C is the boundary of R, where R is the rectangle $|x| \leq A, |y| \leq B$.

Unit IV

8. (a) Derive constitutive equation of three parameter solid.

- (b) Explain creep and relaxation phenomena of Maxwell model.

9. Derive elastic and viscoelastic solution of the walled tube in plane strain of Kelvin model using correspondence principle.