

- (b) Types of trusse
- (c) Free body diagram

9. Explain various theories of failure.

15

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-(P-4)(Q-9)(21) (4)

Roll No.

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**B. Tech. 3rd Semester (Civil Engg.)
Examination – March, 2021**

ENGG. MECHANICS

Paper : PCC-CE-203-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Section. Question No. 1 is compulsory. All questions carry equal marks.

1. Explain any of five following terms : 3 × 5 = 15
- (a) Principal stress and plains
 - (b) Thermal stresses
 - (c) Torsion of circular shafts

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- (d) Volumetric strain
- (e) Equivalent bending moment & torque
- (f) Composite system

SECTION - A

2. Explain the Concept of various types of Stresses and Strain also establishes the relation in between Elastic Constants. 15
3. The state of stress at a point in a stressed material is given by

$$\sigma_x = 20 \text{ MPa}, \sigma_y = 10 \text{ MPa}, \tau_{xy} = 25 \text{ MPa}$$

Determine the direction and magnitude of the principal stresses in the material. Also locate the planes of maximum shearing stress and calculate the normal and shear in stress on these planes. 15

SECTION - B

4. A cantilever 1.5 m long is loaded with a uniformly distributed load of 2 kN/m run over a length of 1.25 m from the free end. It also carries a point load of 3 kN at a distance of 0.25 m from the free end. Draw the shear force and bending moment diagrams of the cantilever. 15

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-(P-4)/(Q-9)/(21) (2)

5. An I-section beam 350 mm x 150 mm has a web thickness of 10 mm and a flange thickness of 20 mm. If the shear force acting on the section is 40 kN, find the maximum shear stress developed and shear stress distribution across the section. Also calculate the total shear force carried by the web. 15

SECTION - C

6. Find the Euler crushing load for a hollow cylindrical cast iron column 20 cm external diameter and 25 mm thick, if it is 6m long and is hinged at both ends.

Take $E = 1.2 \times 10^6 \text{ N/mm}^2$. Compare the load with the crushing load as given by the Rankine's formula, taking $\sigma_c = 550 \text{ N/mm}^2$ and $a = 1/1600$; for what length of the column would these two formulas give the same crushing load? 15

7. Derive the well known torsion formula for shafts of circular cross-section. 15

SECTION - D

8. Write the short note on the following: $5 \times 3 = 15$
- (a) Equilibrium conditions of Truss

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-(P-4)/(Q-9)/(21) (3)

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