

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.ARCH
BRANCH: ARCHITECTURE

SEMESTER : I
SESSION : MO/19

SUBJECT: AR204 STRUCTURAL MECHANICS

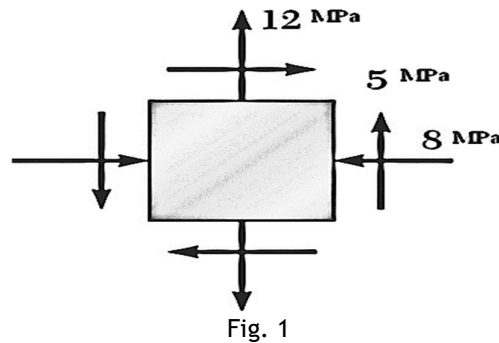
TIME: 3 HOURS

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) For the given state of stress shown in Fig.1 draw Mohr's circle. From the Mohr's circle, determine the values of principal stresses and locations of principal planes. ($\sigma_x = -8$, $\sigma_y = 12$, $\tau_{xy} = -5$, all the stresses are in MPa) [5]



- Q.1(b) With an example, analyze the general procedure to draw Mohr's circle for plane strain condition and to find out the principal strains and maximum shear strain. [5]

Q.2(a) What is pure bending? What are the assumptions made in deriving the bending equation [5]

Q.2(b) A timber beam carries a uniformly distributed load of 15 kN/m over its entire simply supported span of 4m. If the permissible shear stress for timber is 0.8 MPa, design a suitable rectangular beam section based on permissible shear stress. Take the width of rectangular beam as one-third of its depth. [5]

Q.3(a) Write down the theorems of area-moment method and explain them. [5]

Q.3(b) A simply supported beam of length L carries a uniformly distributed load w per unit span over the entire length of the beam. Develop the expression for the maximum deflection of the beam using double integration method. The flexural rigidity of the beam = EI. [5]

Q.4(a) Explain with an example how strain energy is used to find the deflection of a beam? [5]

Q.4(b) Using Castigliano's theorem, determine the deflection at the free end of a cantilever beam of length L due to a concentrated load W at the free end. [5]

Q.5(a) What is slenderness ratio? How slenderness ratio determines the type of column? [5]

Q.5(b) Derive Euler's formula when one end of the column is fixed and other end free. [5]