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**University Examinations 2014/2015**

FIRST YEAR, SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

**ECV 0205: THEORY OF STRUCTURES I**

**DATE: DECEMBER 2014 TIME: 3 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**SECTION A (COMPULSORY)**

**QUESTION ONE (30 MARKS)**

1. Define the terms: rigidity modulus and elasticity modulus (2 marks)
2. Sketch the stress-strain diagram for structural mild steel and briefly explain various important points on it (6 marks)
3. Explain the following forms: (3 marks)
4. Area moment of inertia
5. Centre of gravity
6. Radius of gyration
7. Using a sketch illustrate four types loads that act on beams (4 marks)
8. A uniform cantilever beam of length 3m ahs weight per meter of 120 kN, determine the shear force and bending moments at distance 1m and 3m from the free end if no other loads are acting on the beam (6 marks)
9. Two parallel walls 6m apart are stayed together by steel rod 20mm diameter passing through metal plates and nuts at each end, the nuts are tightened when the rod is at temperature of 1000c, determine the stress in the rod when the temperature falls down to 200c if the ends do not yield and if the ends yield by 1mm. $E$=2N/mm2 and $∝\_{s}$=$12$ (6 marks)
10. Calculate the second moments of area of the section shown in figure 1 about the x-x axis  **(3 marks)**

**SECTION B (ANSWER ANY TWO QUESTIONS)**

**QUESTION TWO**

1. The following observations were made during a tensile test on a mild steel specimen 400mm in a diameter and 200mm long, elongation with 40 kN load within limit of proportionality =0.0304mm, yield load =161kN, maximum load =242 kN, length of specimen at fracture =249mm. Determine: young’s modulus, yield point stress, ultimate stress and percentage elongation. (10 marks)
2. A cantilever of length 2m carries a load of 12kN at its free end, what and where will be the resulting maximum bending moment and maximum shear force (5 marks)

**QUESTION THREE**

1. Draw the S.F and B.M diagram for the simply supported beam as shown in figure 2 (10 marks)
2. A rod is formed with one part of it having a diameter of 60mm and length 120mm and the other part of diameter of 30mm and length 90mm and is subjected to a tensile load of 20kN, calculate the stresses in the two parts and total extension if the modulus of elasticity of the material is 200 Gpa (5 marks)

**QUESTION FOUR**

1. A compound tie consists of square timber core 75mmx75mm with 75mmx12mm steel plate bolted to the opposite sides, calculate the safe axial load for the member if the permissible stresses in timber and steel are 6.3N/mm2 and 140N/mm2 respectively. Young’s moduli:timber=8KN/mm2 and steel=200KN/mm2 (9 marks)
2. Find the ceutroid of the section in figure 3 (all dimensions are in mm) (6 marks)