ELIZADE UNIVERSITY

Pragmatic Innovation for Development

FACULTY: ENGINEERING
DEPARTMENT: CIVIL ENGINEERING
FIRST SEMESTER EXAMINATION (MARCH 2017)
2016/2017 ACADEMIC SESSION

Course Title: STRENGTH OF MATERIALS II

Course Code: CVE 311

HOD'S SIGNATURE

Instructions:

1) **Attempt any FOUR questions**
2) **Time Allowed: 2.5 hours**
3) **SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM**

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ELIZADE UNIVERSITY, ILARA-MOKIN
FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
FIRST SEMESTER 2016/2017 EXAMINATIONS
CVE 311: STRENGTH OF MATERIALS II

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TIME ALLOWED: 2.5Hours.

Question 1 (25 marks)

A simply supported beam of span 6 m has cross-section 100 mm x 250 mm. If the permissible stress is 8 N/mm^2, find the maximum intensity of the uniformly distributed load it can carry, and the maximum concentrated load W applied at 2 m from one it can carry.

Question 2 (25 marks)

a. A rolled steel joist of I-section shown in Figure Q2, has the following dimensions:
Flange: 250 mm wide and 24 mm thick.; Web: 12 mm thick and Overall depth: 600 mm.
If this beam carries a uniformly distributed load of 50 kN/m run on a span of 10 m. Calculate the maximum stress produced due to bending. (13 marks)

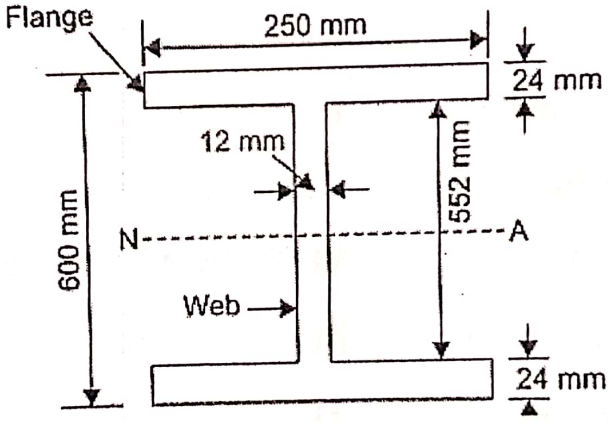

Figure Q2: A rolled steel joist of I-section

b. A floor carrying a load of 6 kN/m^2, is supported on timber joists of 100 mm x 200 mm over a span of 4 m. Calculate the spacing of joists if the bending stress is not to exceed 10 N/mm^2. **(12 marks)**

Question 3 (25 marks)

a: A cantilever beam is 5 m long and has a point load of 50 kN at the free end. The deflection at the free end is 3 mm downwards. The modulus of elasticity is 205 Gpa. The beam has a solid

rectangular section with a depth 3 times the width. (D=3B). Determine (i) the flexural stiffness (ii) the dimensions of the section. **(13 marks)**

b: A cantilever 2.4 m long carries a point load of 30 kN at its free end. Find the slope and deflection of the cantilever under the load. Take fexural rigidity for the cantilever beam as 25×10^{12} Nmm^2**(12 marks)**

Question 4 (25 marks)

a: A circular bar is subjected to an axial pull of 18,000 kg (180 kN). If the maximum intensity of shear stress on any oblique plane is not to exceed 650 kg/cm^2 (65 N/mm^2), determine the diameter of the bar. **(13 marks).**

b: A steel bar tie bar is 10 m long and 100 mm x 25 mm in cross-section. It is subjected to an axial pull of 300 kN and the increase in the length is found to be 5 mm. Find the intensity of the stress on a normal cross-section, the intensity of the normal and shear stresses on a plane section inclined at 60^0 to the longitudinal axis, and the modulus of elasticity of the steel. **(12 marks)**

Question 5 (25 marks)

a: The principal stresses at a point in a material are 900 kg/cm^2 (90 N/mm^2) tension and 600 kg/cm^2 (60 N/mm^2) compression. Find analytically the normal and shear stresses on a plane inclined at 300 to the plane of greater principal stress. (13 marks)

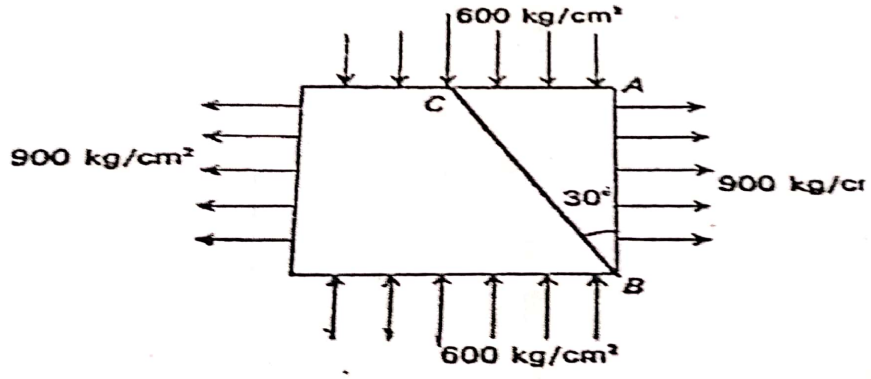

Fig. Q5: Principal Stresses at a point on A material

b. A plane stress at a point is defined as $\sigma_x = 20N/mm^2$ *compressive*, $\sigma_y = 40\ N/mm^2$ tensile and $\tau = 10\ N/mm^2$. Find the principal stresses at the point. **(12 marks)**