EU UNIVERSITY

FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
FIRST SEMESTER EXAMINATION (MARCH 2018)
2017/2018 ACADEMIC SESSION

HOD'S SIGNATURE

Instructions:

1) **Attempt any five Questions**
2) **Time Allowed: 3 hours**
3) **SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAMINATION**

Course Title: STRENGTH OF MATERIALS II

Course Code: CVE 311/MEE 309

ELIZADE UNIVERSITY, ILARA-MOKIN
FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
FIRST SEMESTER 2017/2018 EXAMINATION

Course Title: STRENGTH OF MATERIALS II **Course Code:** CVE 311/MEE 309
Instructions: Attempt **ANY FIVE** questions **Time allowed:** 3 hours. **Units:** 3

Question 1 (25 marks)

Explain the following items:

a) Bending Moment and Shearing Force. (5 marks)
b) Bending Stress and Shearing Stress. (5 marks)
c) Shear Centre and Shear Flow. (5 marks)
d) Slope and Deflection in beams. (5 marks)
e) Moment of Resistance and Section Modulus. (5 marks)

Question 2 (25 marks)

a) A circular bar is subjected to an axial pull of 18,000kg. If the maximum intensity of shear stress is not exceed 650 kg/cm^2 , determine the diameter of the bar. (12.5 marks)

b) For a beam under bending, show that $\frac{\delta}{E} = \frac{y}{R}$ (12.5 marks)

Question 3 (25 marks)

a) A floor carrying a load of 6 kN/m^2, is supported on a 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. (10 marks)

b) A cantilever beam of span 6 m has a 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. (10 marks)

c) A simply supported beam 3 m long is carrying a point load at its centre. If the slope at the end of the beam is not to exceed 1°, find the deflection at the centre of the beam. (10 marks)

Question 4 (25 marks)

a) A simply supported beam with a point load 'W' at the middle (L/2) has its slope 'i' and deflection 'y' equation as $\pm\frac{wl^2}{16EI}$ and $-\frac{wl^2}{48EI}$. Derive these equations. Take $EI\frac{d^2y}{dx^2} = M$ (12.5 marks)

b) Awooden beam 100 mm wide, 250 mm deep and 3 m long is carrying a uniformly distributed load of 40 kN/m. Determine the maximum shear stress. (12.5 marks)

Question 5 (25 marks)

a) A timber beam of rectangular section has a span of 4.8 m and simply supported at its ends. It is required to carry a total load 45 kN/m UDL over the whole span. Find the values of the breadth (b) and depth (d) of the beam, if the maximum bending stress is not to exceed $7N/mm^2$ and the deflection is limited to 9.5 mm. Take $E = 10.5x10^3$. (12.5 marks)

b) Show that the shear centre of a channel section in Figure Q5 having eccentricity (*e*) is $e = \frac{b^2h^2t}{4I}$ (12.5 marks)

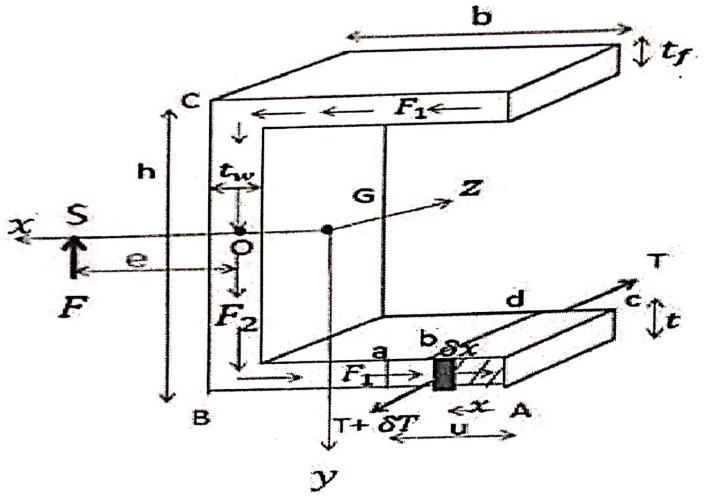

Figure Q5: A Channel Section

Question 6 (25 marks)

a) A simply supported beam is 5 m long and has a load of 50 kN/m accros its span. 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. (12.5 marks)

b) For a loaded beam, show that shearing stress at a section is $\frac{FAy}{Ib}$. (12.5 marks)

Question 7 (25 marks)

a) Find the shear centre for the channel section shown Figure Q7. Given that b = 4.5 cm, h = 9 cm, t = 1 cm. (12.5 marks)

b) Show that the resultant principal stress on an Oblique section of a body subjected to a direct stress in one plane is $\sigma_R = \sqrt{\sigma^2 + \tau^2}$ (12.5 marks)

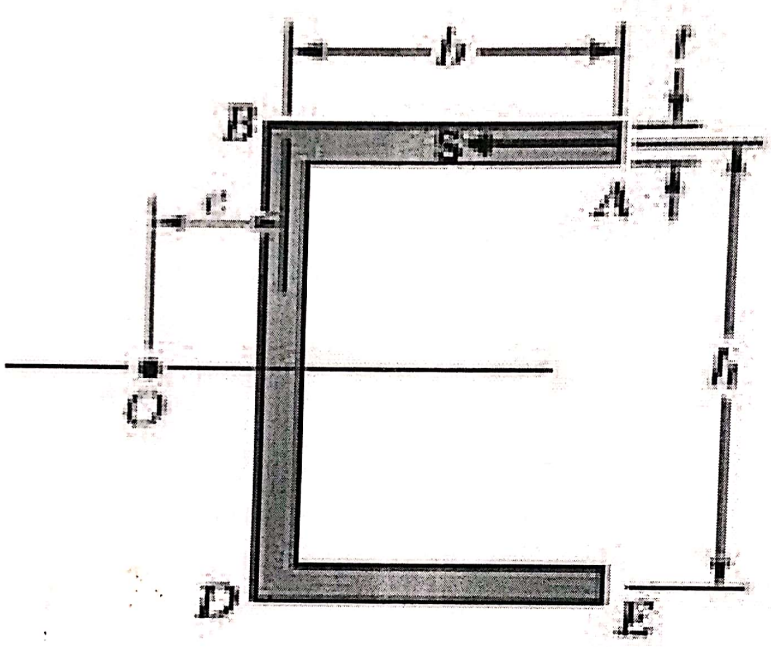

Figure Q7: Channel Section of a C column