ELIZADE UNIVERSITY, ILARA-MOKIN
FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
FIRST SEMESTER 2019/2020 EXAMINATIONS

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

Question 1 (15 marks)

Explain the following

a) Bending Moment and Shearing Force **(3 marks)**
b) Bending Stress and Shearing Stress **(3 marks)**
c) Second Moment of Area and Radius of Curvature **(3 marks)**
d) Slope and Deflection in beams **(3 marks)**
e) Shear Centre and Shear flow **(3 marks)**

Question 2 (15 marks)

a) A circular bar is subjected to an axial pull of 180 kN. If the maximum intensity of shear stress is not exceeding 65 N/mm^2, determine the diameter of the bar. **(5 marks)**

b) Find the shear centre for the I-beam of unequal flanges as shown in **Figure Q2b** **(10 marks)**

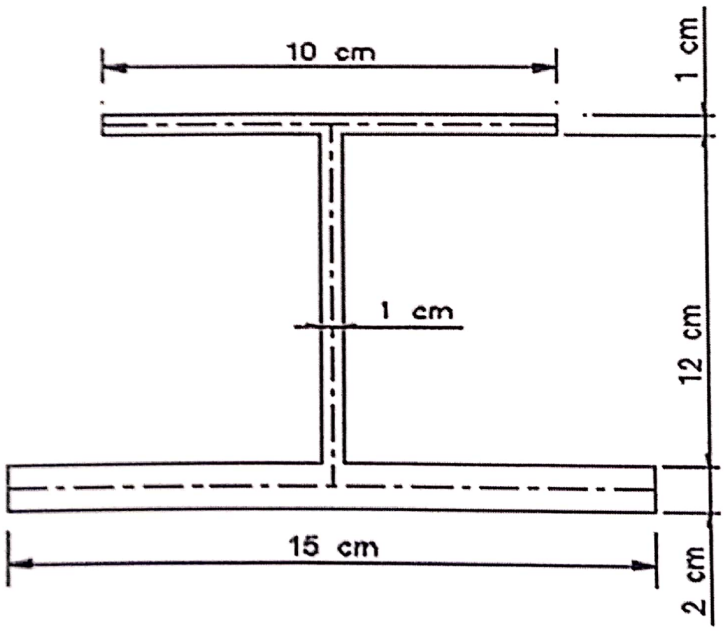

Figure Q2b : Unequal I-Beam Section

Question 3 (15 marks)

a) A uniform T-section beam is 100 mm wide and 150 mm deep with a flange thickness of 25 mm and a web thickness of 12 mm (**Figure Q3a**). If the limiting bending stress for the material of the beam are 80 MN/m^2 in compression and 160 MN/m^2 in tension, find the maximum uniformly distributed load (UDL) that the beam can carry over a simply supported span of
5 m.

(10 marks)

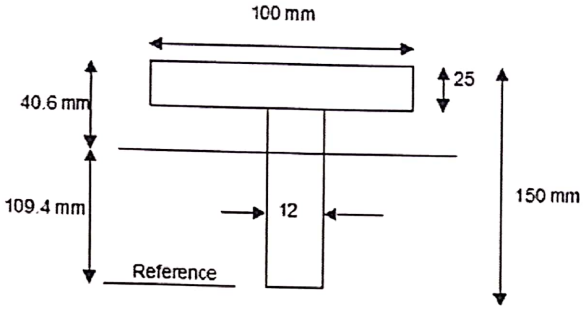

Figure Q3a: Uniform T-Section Beam

b) A floor carrying a load of 6 kN/m^2 is supported on a timber joist 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.

(5 marks)

Question 4 (15 marks)

a) Show that the moment of inertia I_{xx} of a rectangular section is $\frac{bd^3}{12}$ **(10 marks)**

b) 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. **(5 marks)**

Question 5 (15 marks)

a) Show that the maximum shearing stress τ_{max} of a rectangular section is 1.5 $\tau_{avg.}$ **(6 marks)**

b) 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 $-\frac{Wl^3}{48EI}$. Derive these equations. Take $EI\frac{d^2y}{dx^2} = M$

(9 marks)

Question 6 (15 marks)

a) A wooden bar is subjected to a tensile stress of 5 Mpa. What will be the values of normal and shear stresses across a section, which makes an angle of 25° with the direction of the tensile stress.

(5 marks)

b) Derive expression for stress on an oblique section of a body subjected to a direct stress.

(10 marks)