KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2019/2020

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN REAL ESTATE

BRE 201: THEORY AND DESIGN OF STRUCTURES

DATE: Monday, 9th December 2019 **TIME:** 2.00 p.m. - 4.00 p.m.

INSTRUCTIONS:

Answer Question ONE and ANY OTHER TWO questions from Section Two.

SECTION 1: COMPULSORY (30 MARKS)

QUESTION 1

a) Describe the following terms as applied in theory of structures

i) Materials

ii) Structural elements

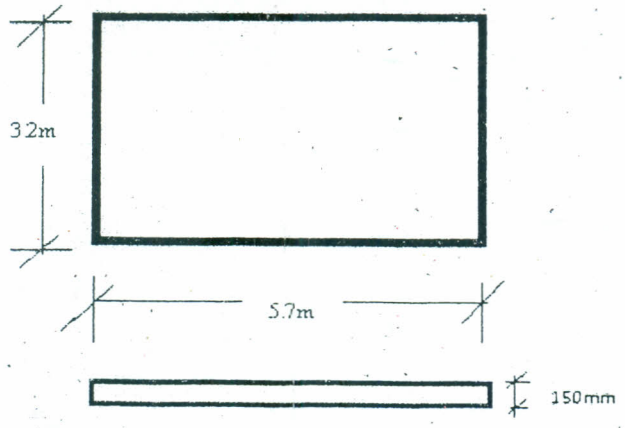
iii) Structure

iv) Structural system (4 marks)

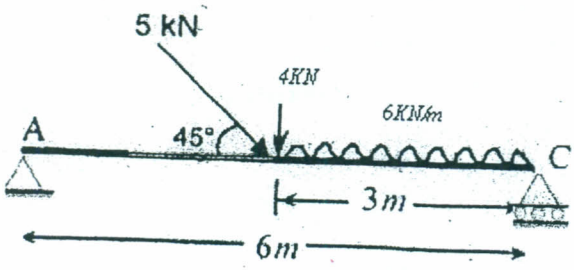
b) State and explain the two main classifications of loads. (2 marks)

c) For a residential building slab shown below, calculate the maximum design load using $1.4g_k+1.6q_k$ loading combination.

(Take concrete density= 24KN/m^3, live loads for residential buildings= 2.0KN/m^2) (4 marks)

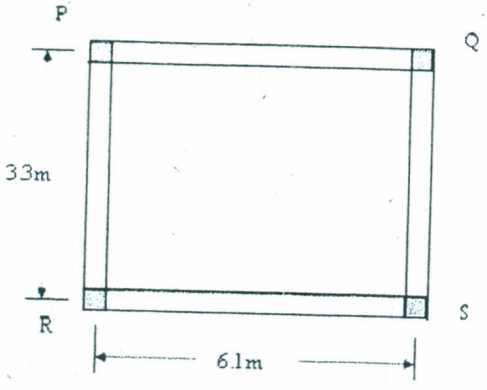


d) Find the reactions for the simply supported beam ABC as illustrated below. (5 marks)

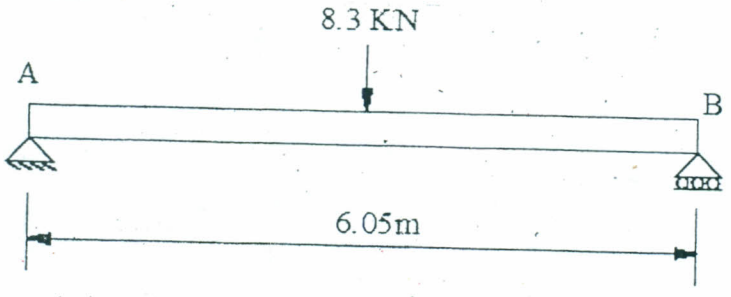


e) For an office building slab thickness 150mm and with slab finishes of 0.6KN/m^2 shown below, calculate the design loading transferred to beams PQ and PR. (6 marks)

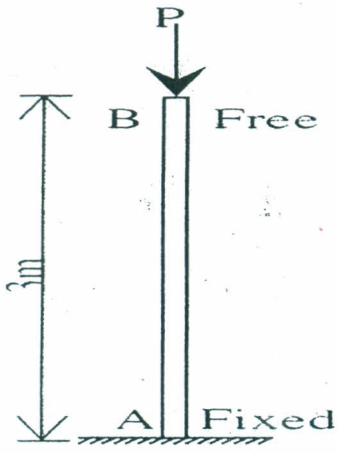
(Take concrete density= 24KN/m^3, loading combination $1.4g_k+1.6q_k$ and live loads for office buildings= 3.0KN/m^2)



f) For the beam AB shown below, compute the shear force and bending moment function and sketch the shear force and bending moment diagrams. (6 marks)



g) A uniform column AB 3m in height and having a circular section of 25cm is a shown below. Using Eulers formula, determine the buckling load for the column. (take E = 200KN/mm^2) (For a column with one end fixed, other end completely free, *le*=2.0*l*) (3 marks)

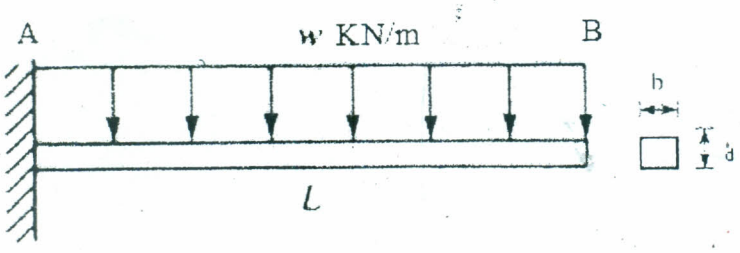


SECTION 2: ANSWER ANY TWO QUESTIONS (40 MARKS)

QUESTION 2

a) State any TWO assumptions that are made in the bending theory. (2 marks)

b) Consider the beam AB shown below of span *L* m, loaded with a Uniformly Distributed Load *w*KN/m. Compute the slope and deflection in terms of w, L, E and I. (12 marks)



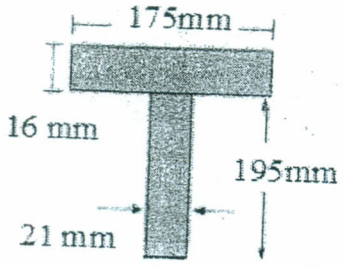
If the beam in (b) above s 2.95m in length, load w = 15*KN/m*, E = 800N/mm^2 and the section of the beam is 300mm by 300mm, calculate the slope and deflection at the free end of the beam. (6 marks)

QUESTION 3

a) A prismatic steel bar 625mm long is stretched 0.3125mm by a tensile force P. Find the magnitude of the force P in KN if the volume of the bar is 500x10^{3}mm^3 and E = 1.95x10^{5}N/mm^2. (5 marks)

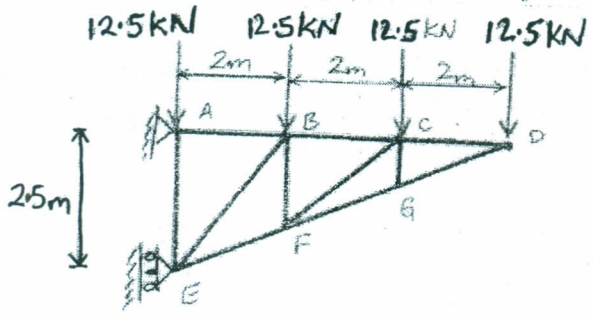
b) With the aid of a sketch, prove that the moment of inertia of a body with total area A is $I_{xx=\sum ay^2}$ with respect to x axis and $I_{yy=\sum ax^2}$ with respect to y axis. (4 marks)

c) Consider the T-beam section shown below. Calculate and locate the position of the centroid. (11 marks)



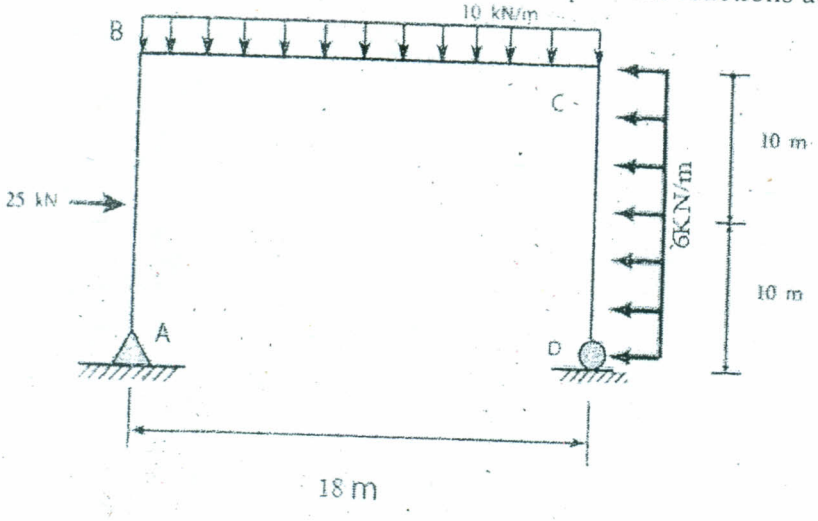
QUESTION 4

For the truss shown below, analyze the reactions at the supports and determine the internal forces in each of the members using method of joints. (20 marks)



QUESTION 5

a) For the frame ABCD shown below, compute the reactions at supports A and D (6 marks)



b) For the three hinged arch shown below, compute the forces at the hinge connections A, B and C.

(14 marks)