KENYATTA UNIVERSITY

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN REAL ESTATE MANAGEMENT

BRE 201: THEORY AND DESIGN OF STRUCTURES

1ST SEMESTER 2021/2022 TIME: 2Hours

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) Explain the two main classifications of loads. (1 marks)

c) Explain the concept of statics as used in structures (2 marks)

d) Find the reactions for the simply supported beam ABC as illustrated below in figure 1d (5 marks)

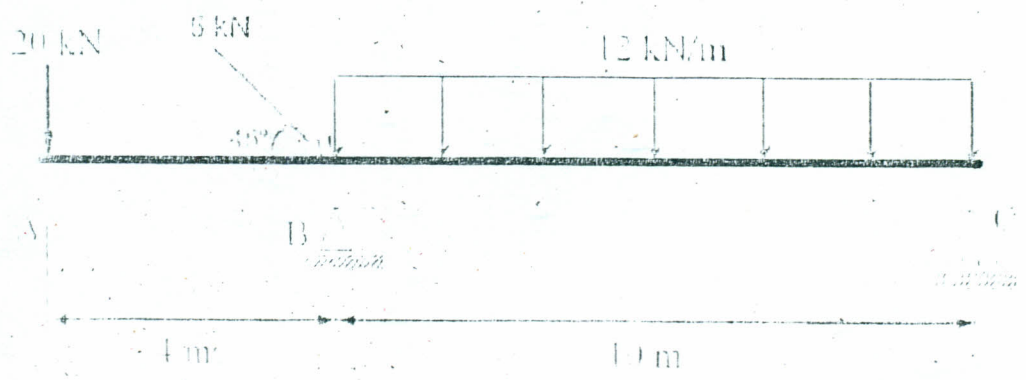

Fig 1d

e) For a residential building slab thickness 125mm and with slab finishes of 0.55KN/m^2 shown in figure 1c 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 residential buildings= 2.0KN/m^2)

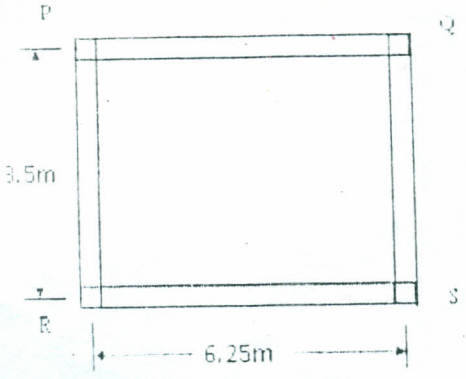

Fig 1e

f) For the beam AB shown in figure 1f, compute the shear force and bending moment function and sketch the shear force and bending moment diagrams. (6 marks)

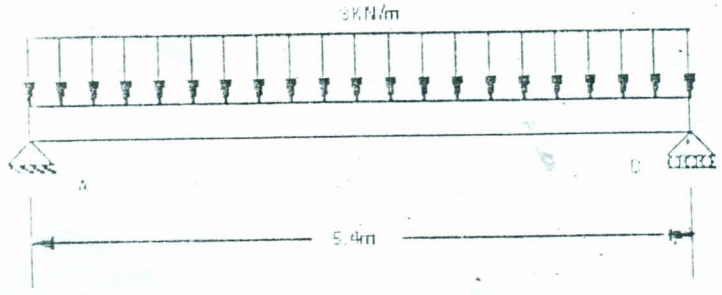

Figure 1f

g) For an office building slab PQRS thickness 150mm, in figure 1g calculate the maximum design load using $1.4g_k+1.6q_k$ loading combination.

(Take concrete density= 24KN/m^3, live loads for offices = 3.0KN/m^2) (3 marks)

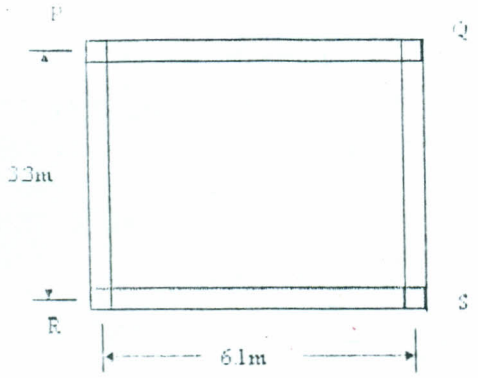

Fig 1g

h) A uniform column AB of height 3.2m, one end fixed and one end pinned, and having a cross-section of 25cm by 20cm is subjected to an axial load. Using Eulers formula, determine the critical load for the column. (take E= 200KN/mm^2) (3marks)

SECTION 2: ANSWER ANY TWO QUESTIONS (40 MARKS)

QUESTION 2

For the truss shown in figure 2 analyze the reactions at the supports and determine the internal forces in each of the members using method of joints. (20 marks)

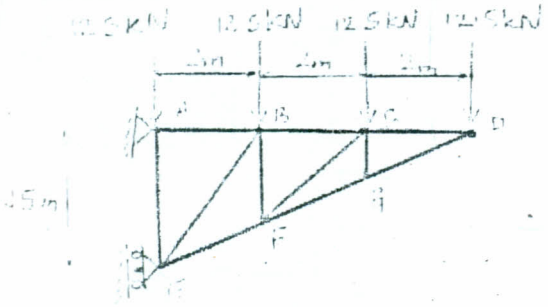

Fig 2

QUESTION 3

a)Explain the concept of shear strain in materials and show that shear strain is given by $\phi = \frac{\delta_s}{l}$ (3 marks)

b) A prismatic steel bar 655mm long is stretched 0.63mm by a tensile force P. find the magnitude of the force P in KN if the volume of the bar is 450x10^{3}mm^3 and E= 1.975x10^{5}N/mm^2 (5 marks)

c) 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)

d) Consider the I-beam section shown in figure 3d. Calculate the position of the centroid. (8 marks)

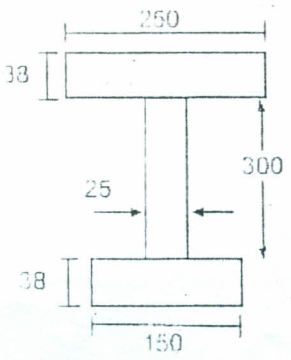

Fig 3(d)

QUESTION 4

a) For the frame ABCD shown in figure 4(a), compute the reactions at supports A and D (6 marks)

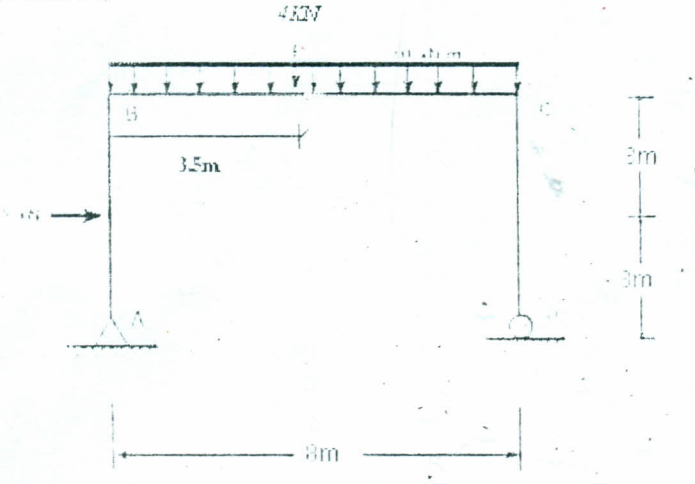

Fig 4(a)

b) For the three hinged arch shown in figure 4(b), compute the forces at the hinge connections A, B and C. (14 marks)

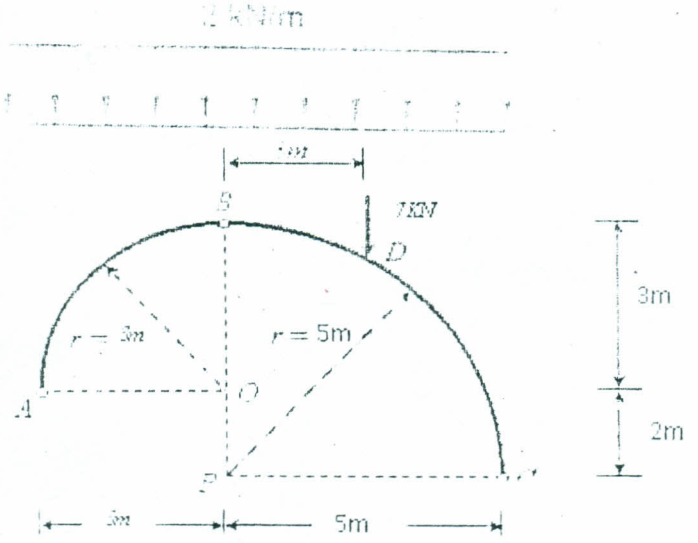

fig 4(b)

QUESTION 5

a) State any **FIVE** assumptions that are made in theory of bending of beams. (5 marks)

b) Consider the beam AB shown in figure 5b of span L m, loaded with a Uniformly Distributed Load wKN/m. Compute the slope and deflection in terms of w, L, E and I
(9marks)

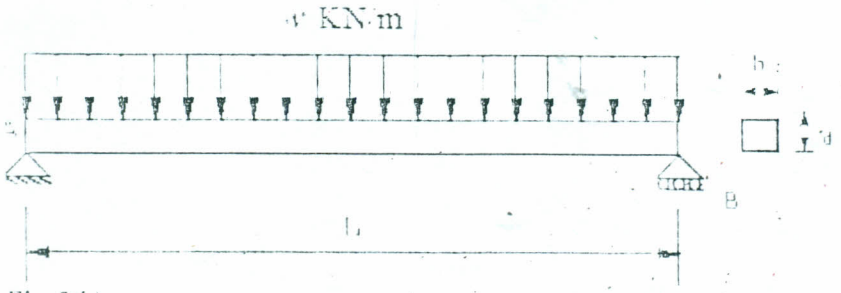

Fig 5(b)

c) If the beam in (b) above is 2.95m in length, load $w = 12.5KN/m$, $E = 800N/mm^2$ and the section of the beam is $275mm$ by $275mm$, calculate the slope and deflection at the supports and center of the beam respectively. (6marks)