



TECHNICAL UNIVERSITY OF MOMBASA
FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
ECE 2215: THEORY OF STRUCTURES II
SPECIAL SUPPLEMENTARY EXAMINATION
SERIES: SEPT. 2017
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions.

Answer question ONE (COMPULSORY) and any other TWO questions

Do not write on the question paper.

QUESTION ONE (COMPULSORY)

- a) Using elaborate sketches explain the 3 different types of arches depending on support conditions **(6 Marks)**
- b) A parabolic arch, hinged at springing and crown has a span of 30 m and central rise 6 m. Determine the magnitude of maximum positive and negative bending moment at a section 10 m from left hand support, when a point load 90 kN rolls over the beam. **(12 Marks)**

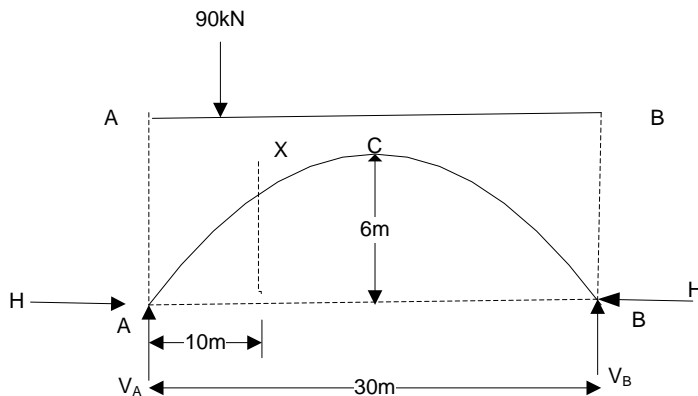


Fig 1(c).

- c) Using double integration method, show that for a cantilever with a uniformly Distributed Load the maximum deflection is given by
$$= \frac{Wl^4}{8EI}$$
 (12 Marks)

ATTEMPT ANY TWO QUESTIONS

QUESTION TWO

(a) A single point load of 80 kN crosses a girder of 12 m span. Using influence lines, find the maximum positive and negative shear force and bending moment at a point 4 m from the left end. (15 Marks)

b).A simply supported beam of span 3 m is subjected to a central load of 10 Kn. Find the maximum slope and deflection of the beam. Take $I = 12 \times 10^6 \text{ mm}^4$ and $E = 200 \text{ GPa}$. (5 Marks)

QUESTION THREE

a) Using double integration method, show that for Cantilever with a point load at its free End the maximum deflection is given by $\frac{wl^3}{3EI}$ (10 Marks)

b) A cantilever beam of 160 mm width and 240 mm depth is 1.75 m long. What load can be placed at the free end of the cantilever, if its deflection under the load is not to exceed 4.5 mm. Take E for the beam material as 180 GPa. (10 Marks)

QUESTION FOUR

A Pratt truss consists of 6 panels, each of 6 m, its height being 8 m as shown in Fig. 4

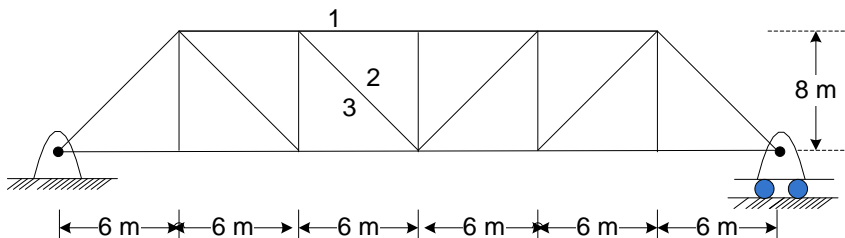


Fig. 4

It is simply supported over a span of 36 m and is loaded over the bottom chord.

- Draw the influence lines for force in member serialled 1, 2 and 3, in the third panel. From the left, giving principal values.
- Calculate the maximum values of forces in members 1, 2 and 3 when a uniformly distributed load of intensity 60kN/m longer than the span crosses the structure. (20 Marks)

QUESTION FIVE

(b)A suspension bridge of 40 m span and 3 m wide platform is subjected to a load of 64kN/m². The bridge is supported by a pair of cables having central dip of 4.5m. Find the necessary cross

sectional area of the cable, if the maximum permissible stress in the cable material, is not to exceed $1.2 \times 10^5 \text{ kN/m}^2$. **(15Marks)**.

b) A cantilever beam 2 m long is subjected to a uniformly distributed load of 5 kN/m over its entire length. Find the slope and deflection of the cantilever beam at its free end. Take $(EI) = 2.5 \times 10^{12} \text{ mm}^2$. **(5Marks)**