Machakos University College

(A Constituent College of Kenyatta University)
University Examinations 2013/2014

SCHOOL OF ENGINEERING

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

Diploma in Building Technology
Diploma in Civil Engineering

Structures 1
Construction Materials 1
Geo technology1
Concrete Technology 1

Date: 20/3/2014 Time: 8:30 – 11:30 am

Instructions

1. This paper consists of two sections A and B. Answer two questions from every section and One question from any section.
2. Each question carry equal marks
3. You should have only a scientific calculator ur smp. No You should have the following for this examination

    - Answer booklet
    - Scientific Calculator

4. Attempt five questions from each section and any other one question from any section

5. Maximum marks for each part of a question as shown

SECTION A:

ANSWER ATLEAST TWO QUESTIONS FROM THIS SECTION

1. (a) Define the following terms as applies to property of sections.

(i) Centre of gravity
(ii) Moment of Area (8 marks)

(b) For the figure shown below. Determine the position of centroid. (12 marks)

X and Y

2. In the section shown in the figure below, Determine

(i) The position of the centroid X and Y (8 marks)
(ii) The second moment of the Area (6 marks)
(iii) The radious of gyration rxx and ryy (6 marks)

(a) State 8 assumptions in the theorysimple Bending

(b) A timber beam 100mm wide by 150mm deep is to be strengthened by two steel plates 100mm x 12 mm, and 100mm x 12 are adequately secured to it. The first plate on top surface and the other below the lower surface. If the maximum permissible stress in steel is 140 N/MM^2, and M = 20

Calculate the moment of resistance of the strengthened section assuming that the timber will not be over stressed. (12 marks)

3. (a) Point of coratraflecture is apoing where the maximum bending occurs on a moment diagram.

(b) A simply supported beam with UOL Loading is shown in the figure below. Compare the steer force values and the bending moment values at all critical points

(a) Sketch the shearing force and bending moment diagrams.

4. (a) (i) Define the term point of contraflecture as its used in bending moment. (2 marks)

(ii) A simply supported beam with UDL loading is shown in the figure below compute the shear force values and the bending moment values of all critical points (4 marks)

(iii) Sketch the shear and bending moment diagrams (4 marks)

(b) (i) Determine the reactions of the following loadings on the beams below. (5 marks)

(ii) Determine the reaction in the figure below (5 marks)

SECTION B:

GEOTECHNOLOGY, MATERIALS CONCRETE TECHNOLOGY

5. (a) Give and explain five objectives of site investigation prior to the commencement of construction works. (10 marks)

   (b) Distinguish between lamin board and block board with a neat diagram. (6 marks)

   (c) State four properties of reinforced concrete. (4 marks)

6. (a) Describe the bessemer process of steel production. (6 marks)

   (b) (i) List six types of cured concrete (3 marks)

   (ii) Explain one of the work mentioned type of con explaining the properties and uses of it. (6 marks)

   (c) Define the following terms in soil properties

   (i) Void ratio
   (ii) Porosity ratio
   (iii) Moisture content (5 marks)

7. (a) (i) Define the term mineralogy as used in engineering geology. (2 marks)

   (ii) State two main rock forming minerals giving two examples of each.. (4 marks)

   (b) (i) Distinguish between thermosetting and thermoplastic. (4 marks)

   (ii) Make a neat sketch of a formwork of a window sill. (5 marks)

   (iii) Explain five advantages of rein forced cement concrete. (5 marks)

8. (a) Describe five methods of site investigation commonly used in engineering works (5 marks)

(b) Name and explain three types of synthetic rubbers, stating one property of each. (4 marks)

(i) Student of building and civil engineering department of Machakos University College were carrying out absorption test on clay products and this were there observations

The initial volume of water before the immersion of the brick was recorded, then after boiling the water for 15 minutes and immersing the brick the volume of water was recorded and the volume of water after removing the brick was recorded.

(i) Calculate the absorption of the brick. (4 marks)
(ii) Why was the purpose of heating water for fifteen minutes? (2 marks)

(c) Calculate the resultant active thrust on a vertical smooth retaining wall of height 5.4M. The water table is well below the base of the wall

Take

$\emptyset = 30^o \quad C' = 0 \quad \gamma = 20KN/m^3$