



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

((A Constituent College of JKUAT)

(A Centre of Excellence)

## Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE IN  
CIVIL ENGINEERING

ECE 2205: THEORY OF STRUCTURES I

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2012

TIME: 2 HOURS

### **Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Table/Pocket Calculator*

This paper consists of **FIVE** questions. Answer question **ONE (COMPULSORY)** any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **FIVE** printed pages

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### **SECTION A (COMPULSORY – 30 MARKS)**

- a) What is a free body in analysis of structures? (3 marks)
- b) Determine the degree of statical indeterminacy for each of the structures shown in figures:  
1(a) - 1(c) (9 marks)

B

- c) Explain how one can inspect for geometric instability in trusses. **(3 marks)**
- d) Two smooth circular cylinders of  $W = 500\text{N}$  and radius  $r = 200\text{mm}$  are connected at their centres by a string AB of length  $L = 600\text{mm}$  and rest upon a horizontal plane, supporting above them a third cylinder of weight  $a = 1000\text{N}$  and radius  $R = 300\text{mm}$ . Figure 1(d). Find the force S in the string AB and the reactions produced on the floor at the points of contact D and E **(7 marks)**

D

- e) Draw the shear force diagram (SFD) and bending moment diagram (BMD) for the beam loaded as shown in figure 1(c) clearly mark the position of the maximum bending moment and determine its value. **(8 marks)**

Figure 1(c)

**SECTION B (ANSWER ANY TWO QUESTIONS FROM THIS SECTION)**

**Question Two (20 marks)**

The frame structure shown in figure 2 has hinges at A,D and F. Determine the components at the reactions at supports A and F and hence sketch the deflected shape, shear force diagram (SFD) and bending moment diagram (BMD) **(20 marks)**

Figure 2

**Question Three (20 marks)**

For the frame structures shown in figure 3, determine the reactions at A and B and sketch the quantitative shear force diagram (SFD) bending moment diagram (BMD) as well as the deflected shape due to the loading shown. **(20 marks)**

40KN

**Question Four (20 marks)**

The compound truss shown in figure 4 consists of two simple trusses ABC and DEF that are linked together by three bars AF, ED and CD. Determine the bar forces in these members. **(20 marks)**

F

**Question Five (20 marks)**

Find the reactions at the fixed end of the cantilever loaded as shown in figure 5. Draw the shear force diagram (SFD) and bending moment diagram (BMD) **(20 marks)**

Figure 5