TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2514: THEORY OF STRUCTURES VII

END OF SEMESTER EXAMINATION

SERIES:APRIL2016

TIME:2HOURS

DATE:13May2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID

This paper consists of four questions. Attempt question ONE (Compulsory) and any other TWO questions.

Question One (30 marks)

a) Define shape factor. From first principle show that the shape factor of rectangular beam section is 1.5 (3 marks)

b) Find the fully plastic moment in the portal frame shown in figure 1 below. The frame has a uniform cross-section throughout.

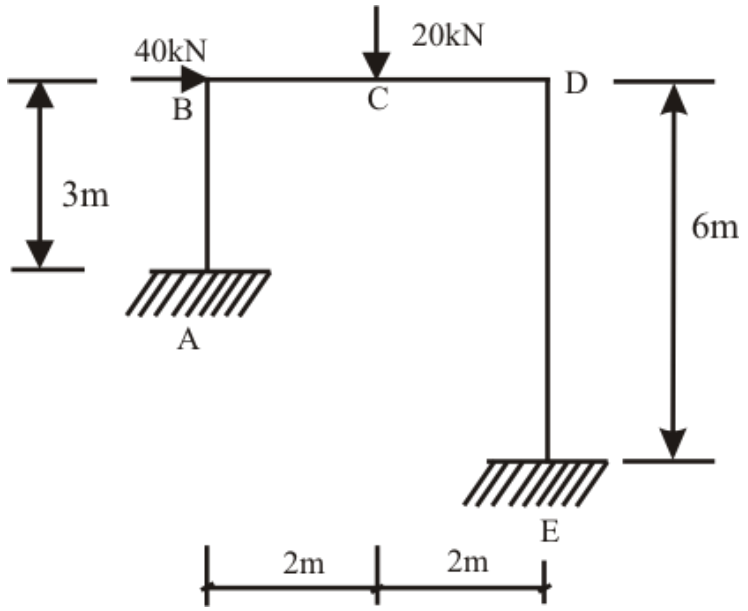

Fig. 1

(13 marks)

c) Using neat sketches outline the plastic mechanisms in plastic analysis of structures. (5 marks)

d) A beam with fixed ends is subjected to load as shown in figure. 4. Estimate the collapse load factor if Mp=20kNm.

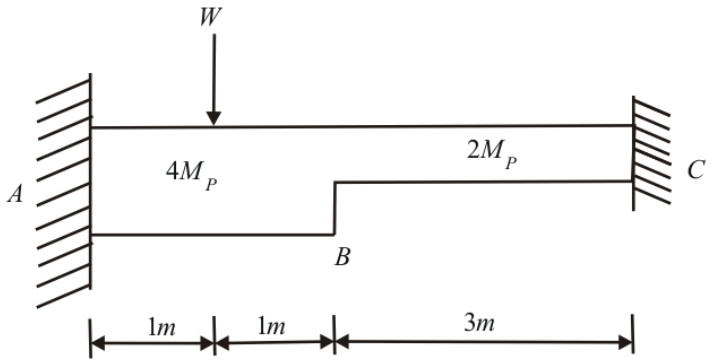

Fig. 4

(9 marks)

Question Two (20 marks)

a) Outline the assumptions of yield line analysis. (7 marks)

b) Figure shows a continuous beam carrying a combination of distributed and point loads. It varies in section with fully plastic moments of each span as shown in the figure 2. Determine the collapse load factor λ of the structure. Take $M_p = 40kNm$.

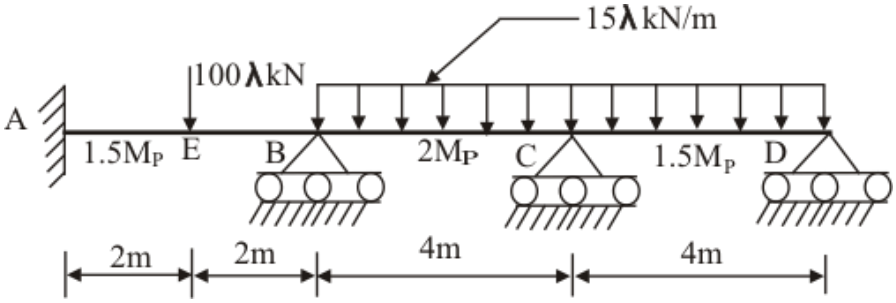

Fig. 2

(13 marks)

Question Three (20 marks)

a) State the advantages and disadvantages of plastic analysis of structures. (7 marks)

b) Using moment-rotation curve explain the following stages.

- Elastic Behaviour
- Elastic Behaviour
- Elasto-Plastic Bending
- Plastic Bending
- Strain Hardening

(10 marks)

c) Define affine transformations. State the rules of affine transformation. (3 marks)

Question Four (20 marks)

a) Briefly explain on the following theories of plates to bring out differences among them.

(i) Thin plates with small deflections.

(ii) Thin plates with large deflections.

(iii) Thick plates

(6 marks)

b) A rectangular slab (fig. 3) is to be used in the construction of low cost lecture rooms at TUM is subject to a load of 12 kN/m^2. Find the collapse load factor.

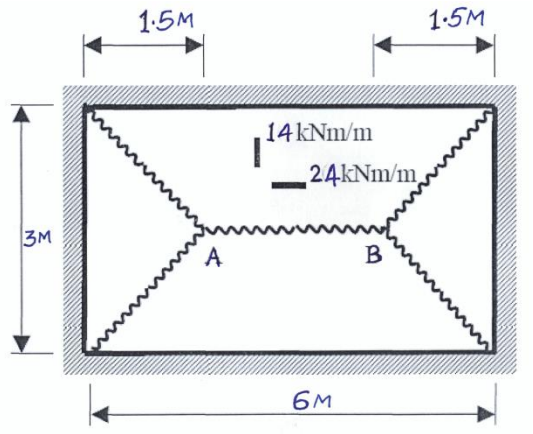

Fig.3

(14marks)