



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING

EMG 2303 : SOLID & STRUCTURAL MECHANICS I

TCV 4215: SOLID & STRUCTURAL MECHANICS I

END OF SEMESTER EXAMINATION

SERIES: APRIL 2017

TIME: 2 HOURS

DATE: Pick Date Apr 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt Choose instruction.

Do not write on the question paper.

Question ONE

A steel bar ABCD is subjected to point loads of P_1 , P_2 , P_3 and P_4 as shown in figQ1. Determine the magnitude of the force P_3 necessary for the equilibrium if $P_1 = 120$ kN, $P_2 = 220$ kN and $P_4 = 160$ kN (20 marks)

Question TWO

A horizontal beam 10 m long is carrying a uniformly distributed load of 1 kN/m. The beam is supported on two supports 6 m apart. Find the position of the supports so that bending on the beam is as small as possible. Also draw the shear force and bending moment diagrams. (20 marks)

Question THREE

The stepped steel shaft shown in figQ3 is subjected to a Torque, T at the free end and a torque 2T in the opposite direction at the junction of the two sizes. What is the angle of twist at the free end if the maximum shear stress in the shaft is limited to 70MPa? Assume the modulus of rigidity to be 84GPa. (20 marks)

Question FOUR

A cylindrical shell has the following dimensions:

Length = 3 m

Inside diameter = 1 m

Thickness of metal = 10mm

Internal Pressure = 1.5 MPa

Calculate the change in dimensions of the shell and the maximum intensity of the shear stress induced. Take E = 200GPa, Poisson's ratio = 0.3 also Shear stress = $\frac{\sigma_2 - \sigma_1}{2}$ (20 marks)

Question FIVE

- a) A copper bar 5 m long and 3000 mm² in cross-section is rigidly fixed at A and D as shown in FigQ5. Determine the loads shared and stresses in each portion and the distances through which the points B and C will move. Take E for the aluminium as 150 GPa. (20 marks)