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KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER
SPECIAL/SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE
ENERGY AND BIOFUELS TECHNOLOGY

COURSE CODE: PRD 221

COURSE TITLE: SOLID MECHANICS I

DURATION: 2 HOURS

DATE: 18TH SEPTEMBER 2017 **TIME:** 11:30AM – 1:30PM

INSTRUCTIONS TO CANDIDATES

- Attempt any five (5) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 3 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

QUESTION ONE

- A) Define the term bending stress and explain clearly the theory of simply bending (5MKS).
B) State the assumptions made in the theory of simple bending (3MKS)
C) Proof the relation
 $M/I = \delta/Y = E/R$
Where M = Bending moment
 I = Moment of inertia
 δ = Bending stress in fibre at a distance Y from neutral axis
 E = Young's modulus
 R = Radius of curvature
- D) Discuss the difference of procedure in finding out the bending stress in
a) Symmetrical section
b) An unsymmetrical section
E) Explain the term strength of a section.

QUESTION TWO

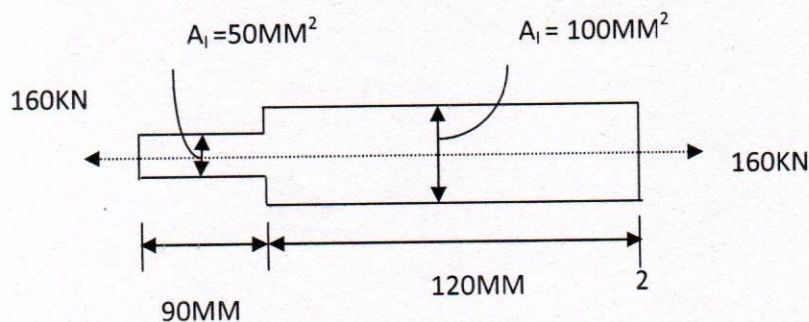
- a) Define stress, strain and elasticity. Derive a relation between stress and strain of an elastic body.
b) State clearly the hooke's law.
c) Derive from fundamental, the relation for the deformation of a body when it is subjected to:
i) A tensile force
ii) Its own weight
d) Establish a relation for the stress in a bar of uniformly tapering section

QUESTION THREE

- a) A steel rod 1M long and 20MM, 20MM in cross-section is subjected to a tensile force of 40KN. Determine the elongation of the rod, if modulus of elasticity for the rod material is 200GPa.
b) A load of 5KN is to be raised with the help of a steel wire. Find the maximum diameter of the steel wire if the stress is not to exceed 100MPa.

QUESTION FOUR

- a) An automobile component shown below is subjected to a tensile load of 160KN. Determine the total elongation of the component, if its modulus of elasticity is 200GPa.



QUESTION FIVE

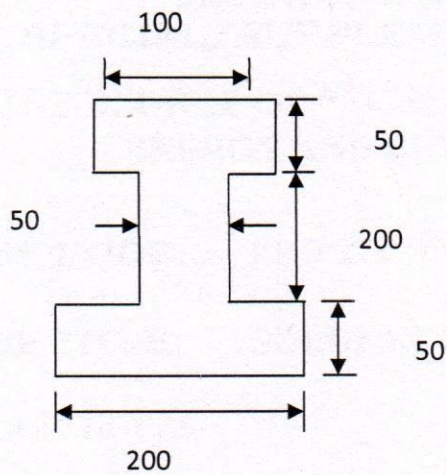
If the tension test is found to taper from $(D+a)$ MM diameter to $(D-a)$ MM diameter, Prove that the error involved in using mean diameter to calculate Young's modulus is $(10a/D)^2$ percent. (20mks)

QUESTION SIX

A steel plate of 20MM thickness tapers uniformly from 100MM to 50MM in a length of 400MM. What is the elongation of the plate if an axial force of 80KN acts on it? Take $E=200$ GPa. (20MKS)

QUESTION SEVEN

Fig below shows a rolled steel beam of an unsymmetrical I-section.



If the maximum bending stress in the beam section is not to exceed 40MPa. Find the moment, which the beam can resist. (20MKS)