



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN
MECHANICAL ENGINEERING
STRENGTH OF MATERIALS I

DATE: 15/12/2017

TIME: 8.30-10.30 AM

INSTRUCTIONS

- This Examination contains two sections A and B
- Section A is compulsory
- Attempt any other two questions from section B

SECTION A: COMPULSORY

- If a mass of 100kg falls 4cm on to a collar attached to a bar of steel 2cm diameter , 3m long, find the maximum stress set up. $E = 205\text{kN/mm}^2$.
 - If in the above case the bar is turned down to 1cm diameter along 1.5 m of its length, what will be the maximum stress and extension caused by the 100kg load falling 4cm? (14 marks)
 - A uniform wooden lath AB, 1.2 metres long and weighing 1.2N rests on two knife edges support C and D placed 0.1 m from each end of the lath respectively. A 0.2N weight hangs from a loop of thread 0.3 metres from A and a 0.9N weight hangs similarly 0.4 metres from B. find the reactions at the supports. (6 marks)
 - The resultant of two forces, one of which is double the other is 260N if the direction of the larger force is reversed and the other remains unaltered, the

resultant reduces to 180N. Determine the magnitude of the forces and the angle between them (10 marks)

SECTION B: SELECT ANY TWO QUESTIONS

2. A beam 10m long is simply supported at its ends and carries concentrated loads of 30kN and 50kN at distances of 3m from each end. Draw the shear force and bending moment diagrams. (20 marks)
3. a) State and prove the theorems of parallel axis (10 marks)
b) find the moment of inertia about X – X axis of an inverted L – section 150mm x 100mm x 25mm (10 marks)
4. a) state sign conventions for stress, strain and temperature (3 marks)
b) A plain bearing consists of a steel housing 80mm outside diameter and 60mm inside diameter fitted with a bronze bush 60mm outside diameter and 50mm inside diameter. Both the steel and bronze are of the same length of 100mm. if the assembly is subjected to an axial compressive thrust of 100kN determine:-
i. The load taken by the steel and the bronze
ii. The contraction of the compound assembly under the load of 100kN.
Take $E_{\text{steel}} = 200\text{GN/m}^2$, $E_{\text{bronze}} = 100\text{GN/m}^2$, (17 marks)
5. A horizontal beam 8m long is simply supported at its left-hand end and at a point 2m from the right-hand end. The beam carries concentrated loads of 60 and 30kN at 1 and m respectively from the left-hand end. The beam also carries a uniformly-distributed load of 10kN/m from the mid-point to the right-hand end. Draw the shearing force and bending moment diagrams to scale, and state the position and magnitude of the maximum bending moment. Neglect the mass of the beam itself. (20 marks)