EAST AFRICAN SCHOOL OF AVIATION EXAMINATION

END TERM I EXAMS

DIPLOMA IN AERONAUTICAL ENGINEERING

AIRCRAFT MECHANICAL TECHNOLOGY I

STREAM: Module II (Airframes & Engines)-MARCH **Duration: 3Hrs**

DATE: 10.04.17 **TIME: 9.00-12.00 pm**

INSTRUCTION TO CANDIDATES

1. *This paper consists of*
2. *You should have the following for this examination:*

   Mathematical tables /

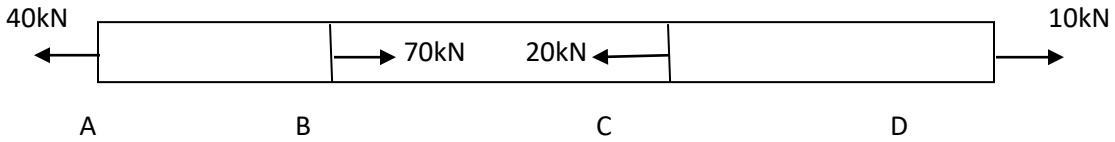
   Electronic calculator.
3. *Answer **ALL THE QUESTIONS IN SECTION A** and **SECTION B** in this paper*

SECTION A: STRENGTH OF MATERIALS

Answer **ALL** questions from this section.

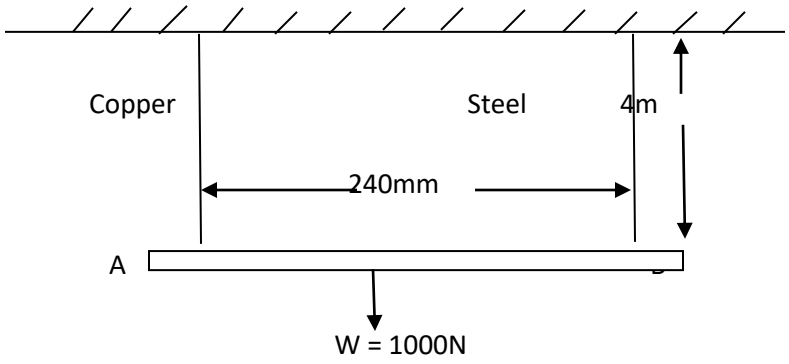
1. (a) State Hooke's law. (**2 marks**)
   (b) Distinguish between tensile stress and compressive stress. (**2 marks**)
   (c) Explain FOUR elastic constants used in materials. **(4 Marks)**
   (c) A steel rod of 2cm diameter is enclosed centrally in a hollow copper tube of external diameter 4cm and internal diameter of 3.5cm. The composite bar is then subjected to an axial pull of 50000N. If the length of each bar is equal to 20cm, determine:
   (i) The stress in the rod and tube
   (ii) Load carried by each bar
   (iii) Extension of the bar.
   Take E for steel = 2×10^5 N/mm^2 and for copper = 1×10^5 N/mm^2 **(12 Marks)**

2. (a) A brass bar having cross-section area of 900mm^2 is subjected to axial forces as shown below. Given that AB= 0.6m, BC= 0.8m and CD= 1.0m.



Find the total extension of the bar. Take E = 1×10^5 N/mm^2 **(10 Marks)**

(b) The figure below shows a horizontal bar supported by two suspended vertical wires fixed to a rigid support. A load W is attached to the bar. The left hand side is of copper wire with diameter of 5mm and the right hand side wire is of steel of 3mm diameter. The length of both wires is initially 4m. (**10 marks**)



Determine

(a) The position of the weight on the bar so that both the wires extend by the same amount
(b) The load, stresses and elongation in each wire.
Neglect the weight of the bar and take E_S = 210GPa and E_C = 120GPa.

3. (a) Define the following terms as applied in beams.

(i) Shearing force

(ii) Bending moment (**2 marks**)

(b) A beam of length 6m is simply supported at its ends and carries a point load of 5kN at the centre. Draw the shearing force and bending moment diagrams and also determine the maximum bending moment. (**18 marks**)

SECTION B: MECHANICS OF MACHINES

Answer **ALL** questions from this section

4. a). Define each of the following terms as used in motion.

i. Angular velocity
ii. Linear acceleration **(2 Marks)**

b). Show that the linear velocity *v* of a body moving round a circular track of radius r, with angular velocity ώ is given by the equation *v* = rώ. **(3 Marks)**

c). The centripetal acceleration of a particle moving along a straight line is zero. Explain. **(3 Marks)**

d). The angular displacement ϑ of a body is a function of time and is given by the equation.

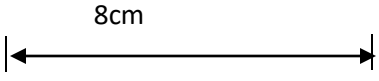
$\vartheta = 10 + 3t + 6t^2$, where t is in seconds

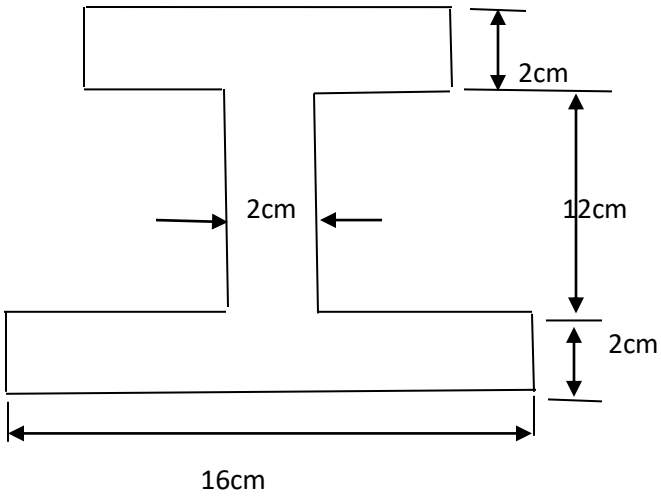
Determine the angular velocity, displacement and acceleration of the body when t = 5 s. (1**2 Marks)**

5. a). Define area moment of inertia. **(2 Marks)**

b). State and derive the perpendicular axis theorem. **(4 Marks)**

c). Find the second moment of area for the I-section shown below. **(14 Marks)**




2cm
2cm
12cm
2cm
16cm