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**BAS-008**

# B.TECH. (AEROSPACE ENGINEERING) (BTAE)

## Term-End Examination

## December, 2013

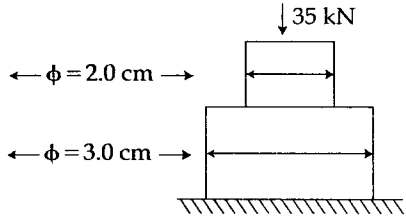
## BAS-008 : STRENGTH OF MATERIALS

*Time : 3 Hours* *Maximum Marks : 70*

***Note :*** *Attempt **any seven** questions. All questions carries **equal marks**. Use of scientific calculator is **permitted**.*

**1.** (a) Give stress - strain relationships for the three orthogonal normal stress system. **5+5=10**

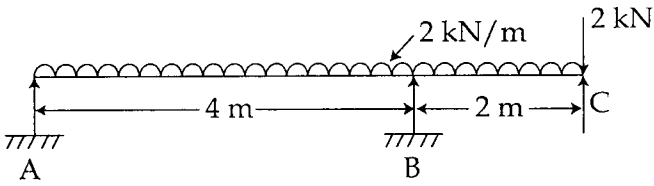
(b) A stepped bar as shown in figure is subjected to an axially applied compressive load of 35kN. Find the maximum and minimum stresses produced.




**2.** (a) Derive an expression for stresses on inclined sections. When an element is in a state of simple shear.

(b) A steel rod of 3cm diameter and 5m long is connected to two grips and the rod is maintained at a temperature if 95°C. Determine the stress and pull exerted when the temperature falls to 30°C, if the ends do not yield. Take $E = 2 \times 10^5 MN/m^2$ and $\alpha = 12 \times 10^{-6}/°C$ **5+5=10**

3. Draw the shear force and bending moment diagrams for the overhanging beam as shown in figure. Locate the point of contraflexure. **10**




4. Prove that the ratio of depth to width of the strongest beam that can be cut from a circular log of diameter 'd' is 1.414. Hence calculate the depth and width of the strongest beam that can be cut of a cylindrical log of wood whose diameter is 300mm. **5+5=10**

5. The stiffness of close-coiled helical spring is 1.5 N/mm of compression under a maximum load of 60N. The maximum shearing stress produced in the wire of the spring is 125N/mm$^2$. The solid length of the spring (when the coils are touching) is given as 5cm. **5+5=10**

   Find (i) diameter of wire
   (ii) no.of coils required.

6. (a) What do you understand by the term "Theories of failure". Briefly describe the important theories of failure. **5+5=10**

   (b) Explain with reasons which theory of failure is best suited for ductile materials and brittle materials.

7. (a) Derive the expressions for normal and shear stresses on an oblique plane. **5+5=10**

(b) Explain how will you determine graphically the resultant stress on an oblique plane when a body is subjected to unequal and unlike direct stresses in two mutually perpendicular directions ?

8. (a) Explain the term 'shear stress' and 'complimentary stress' with proper illustrations. **5+5=10**

(b) Derive an expression for the relationship modulus of elasticity and modulus of rigidity.

9. Write short notes on ***any two*** of the following : **5+5=10**

(a) Equivalent section and flitched beam.

(b) Strain energy in torsion.

(c) Applications of Castigliano's theorem.