01201

DIPLOMA VIEP MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

December, 2013

BIME-021 : MECHANICS OF MATERIALS

Time : 2 hours *Maximum Marks : 70*

Note : *Q. 1 is **compulsory**. Answer **any four** from remaining Q. 2 to Q. 8.*

---

1. Choose the best- Answer : **7x2=14**

   (a) The radius of wire of circular cross-section is stated to decrease to half its original value due to stretch of the wire due to load. This will result in modulus of elasticity of wire to :

   (i) get reduced to one fourth of the original value
   (ii) get reduced to half the value
   (iii) become two fold
   (iv) remain unaffected

   (b) Maximum principle stress theory is known as :

   (i) Rankin theory
   (ii) Heigh's theory
   (iii) Guest's theory
   (iv) Von-mises theory

   (c) Pick up the most economical section for the beam :

   (i) square (ii) circular
   (iii) rectangular (iv) I- section

(d) A cantilever beam of rectangular cross-section carries a load W at free end. If the load is halved and the width of beam is doubled, the deflection will be :

(i) 1/8 (ii) 1/4

(iii) 1/2 (iv) 2

(e) Two wires of different materials but of same diameter are connected end to end and a force is applied which stretches them by 1 cm. the two wires will have the :

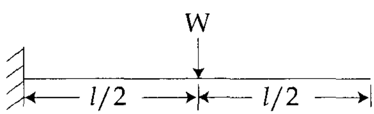
(i) same stress and strain

(ii) same stress but different strains

(iii) different stresses and different strains

(iv) same strain but different stresses

(f) For the cantilever beam shown in figure the maximum deflection will occur at :



(i) mid span of the beam

(ii) free end of the beam

(iii) fixed end of the beam

(iv) between fixed end and mid span

(g) A column with highest equivalent length has :

(i) both ends fixed

(ii) both ends hinged

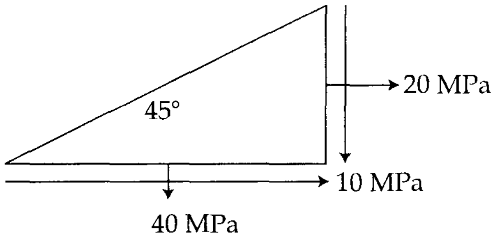
(iii) one end fixed other free

(iv) one end fixed other hinged

2. (a) Derive relation between elastic constant E,G and K. 7+7

(b) Define maximum principal stress theory and show its graphical representation.

3. Find the normal stress and the shear stress on an oblique plane making an angle of 45° with the horizontal plane. 14



4. A simply supported beam carries a uniformly distributed load of 4 kN/m over a span of 6m. Find the maximum bending stress in the beam. Cross-section of the beam is rectangle having a width of 40 mm and depth of 100 mm. Find maximum deflection if the value of $E = 2 \times 10^9$ N/m^2. 14

5. Derive torsion equation. State its assumptions made. 14

6. Derive Euler's formulae for a strut having both end fixed. What are the assumptions and limitations of the Euler's theory ? 14

7. A thick cylinder of 200mm outer diameter and 150 mm inner diameter is subjected to an internal pressure of 12 MPa. Find the maximum stress induced in the cylinder. 14

8. Write short notes on *any four* of the following : $3\frac{1}{2} \times 4 = 14$

   (a) Stress strain diagram for ductile and brittle material
   (b) Assumptions in bending theory
   (c) Application of pressure vessels
   (d) Strain energy due to self load
   (e) Rankine's buckling load
   (f) Creep