01070

DIPLOMA VIEP MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

June, 2013

BIME-021 : MECHANICS OF MATERIALS

Time : 2 hours *Maximum Marks : 70*

Note : *Q.1 is* ***compulsory****.Answer* ***any four*** *from remaining Q.No 2 to Q.No.8.*

1. Choose the best Answer for the following. **7x2=14**

(a) The value of Poisson's ratio depends upon :

(i) nature of load

(ii) magnitude of load

(iii) material

(iv) dimension of test specimen

(b) Complimentary shear stresses are

(i) equal both in magnitude and sign

(ii) equal in magnitude but opposite in sign

(iii) unequal in magnitude but of same sign

(iv) equal in magnitude but the direction may be same or opposite

(c) The maximum bending stress in an I-beam occurs :

(i) at the neutral axis

(ii) at the outermost fibre

(iii) at the joint of wedge and the flange

(iv) at the section where shear stress is maximum

(d) A column with one end fixed and the other free has Euler's buckling load of 10kN. If both the ends are fixed the column will be able to sustain a load of :

(i) 20 kN (ii) 40 kN

(iii) 80 kN (iv) 160 kN

(e) The stress produced by a suddenly applied load as compared to that produced by the same load when applied gradually is :

(i) 1.5 times (ii) two times

(iii) three times (iv) four times

(f) The young's modulus E the shear modulus G and the Poisson's ratio v for a material are related by the expression :

(i) $E = 2G(1+v)$ (ii) $E = 3G(1-v)$

(iii) $E = 3G(1 - 2v)$ (iv) $E = 3G(1+2v)$

(g) For an element under the effect of biaxial state of normal stresses, the normal stress on a 45^{o} plane is equal to :

(i) difference of normal stresses

(ii) sum of normal stresses

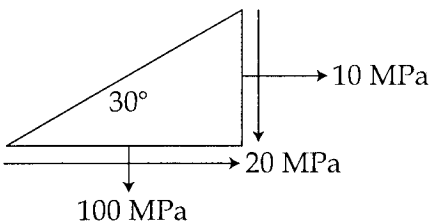
(iii) half the sum of normal stresses

(iv) half the difference of normal stresses

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

(b) Define maximum Principal stress theory and show its graphical representation. 7

3. Find the normal stress and the shear on an oblique plane making an angle of 30^{o} with the horizontal plane. 14



4. A cantilever beam carries a uniformly distributed load of 2 kN/m over a span of 3m. Find the maximum bending stress in the beam. Cross section of the beam is rectangle having a width of 40mm and depth of 100mm. Find maximum deflection if the value of $E=2x10^{9}N/m^{2}$. 14

5. A shaft transmits 800kW of power at 210 rpm. Determine the diameter of the shaft if the angle of twists is not to exceed one degree on a length of 1 meter and shear stress is not to exceed 50 MPa. Take G = 80 Gpa. 14

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

7. A thick cylinder of 100 mm outer diameter and 80 mm inner diameter is subjected to an internal pressure of 8 MPa. Find the maximum stress induced in the cylinder. **14**

8. Write short notes on ***any four*** of the following : **3½x4=14**

   (a) Fatigue failure and Endurance limit

   (b) Mohr's circle

   (c) Stresses in rings

   (d) Moment area method

   (e) Application of pressure vessels

   (f) Concept of strain energy