BIME-025

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)
Term-End Examination
December, 2015

BIME-025 : DESIGN OF MACHINE ELEMENTS

Time : 2 hours   *Maximum Marks : 70*

*Note : Question no. 1 is **compulsory**. Attempt any **four** questions from Q. No. 2 to 8. Design data book is allowed. Scientific calculator is allowed.*

1. Choose the correct answer :   7×2=14

   (a) The H6 – j5, H7 – j6 and H8 – j7 are the
       (i) Clearance fits
       (ii) Transition fits
       (iii) Interference fits
       (iv) All of the above are correct

   (b) The factor of safety increases with an increase in
       (i) Load
       (ii) Reliability
       (iii) Cost
       (iv) Quality

(c) The polar moment of inertia of a solid circular shaft of diameter 'd' is given by

(i) $J = \pi d^2 / 32$

(ii) $\pi d^3 / 32$

(iii) $\pi d^4 / 32$

(iv) $\pi d / 32$

(d) The spring index is given by

(i) $C = (D_i + D_o)/2$

(ii) $C = d/D$

(iii) $C = D/d$

(iv) $C = 2/D_i + D_o$

(e) Width to diameter ratio of a flat key is given by

(i) $b = d/2$

(ii) $d = b/2$

(iii) $b = d/4$

(iv) $d = b/4$

(f) To calculate the shaft diameter of bushed pin type flexible coupling, the following formula is used :

(i) $\tau = \dfrac{16\,Mt}{\pi\,d^3}$

(ii) $\tau = \dfrac{8\,Mt}{\pi\,d^3}$

(iii) $\tau = \dfrac{32\,Mt}{\pi\,d^3}$

(iv) $\tau = \dfrac{64}{\pi\,d^3}$

(g) The application of a knuckle joint
   (i) Fulcrum for the levers
   (ii) Joints between the tie bars in roof trusses
   (iii) Joints between the links of a bicycle chain
   (iv) All the above

2. What is the basic procedure in machine design ? Explain in brief.   *14*

3. Write short notes on the following :   *2×7=14*
   (a) Types, functions and applications of springs
   (b) End styles of springs

4. The cylinder of a 4-stroke diesel engine has the following specifications :

   Brake power = 3·75 kW, Speed = 1000 rpm
   Indicated mean effective pressure = 0·35 MPa
   and Mechanical efficiency = 80%.

   Determine the diameter and length of the cylinder liner.   *14*

5. A rigid coupling is used to transmit 20 kW power at 720 rpm. There are four bolts and the pitch circle diameter of the bolts is 125 mm. The bolts are made of steel 45C8 (S_{yt} = 380 N/mm^2) and the factor of safety is 3. Determine the diameter of the bolts.   *14*

6. A 25 × 50 mm bar of rectangular cross-section is made of plain carbon steel 40C8 (S_{yt} = 380 N/mm^2 and E = 2,07,000 N/mm^2). The length of the bar is 500 mm. The two ends of the bar are hinged and the factor of safety is 2·5. The bar is subjected to axial compressive force.

    (a)   Determine Slenderness ratio.

    (b)   What is the safe compressive force for the bar ?   *14*

7. Explain the modified Goodman diagram for Axial and Bending stresses.   *14*

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

    (a)   Design Synthesis and Creativity in Design

    (b)   Limits, Fits and Tolerances

    (c)   Types of Keys

    (d)   Rankine Buckling Load

    (e)   Morgan's Colour Code

    (f)   ASME Code for Shaft Design

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