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BIME-025

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

01225

December, 2014

BIME-025 : DESIGN OF MACHINE ELEMENTS

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **four** questions from 2 to 8. Question no. **1** is **compulsory**. Design data book is allowed. All questions carry equal marks.*

1. Select the most appropriate answer : *7×2=14*

(a) The property of a material which enables it to resist fracture due to high impact loads is known as

(i) elasticity

(ii) endurance

(iii) strength

(iv) toughness

(b) The fatigue life of a part can be improved by

(i) shot peening

(ii) electroplating

(iii) polishing

(iv) heat treating

(c) Yield point in fatigue loading as compared to static loading is
   (i) same
   (ii) lower
   (iii) higher
   (iv) depends on other factors

(d) Maximum principal stress theory is applicable for
   (i) ductile materials
   (ii) brittle materials
   (iii) elastic materials
   (iv) None of the above

(e) The function of a washer is to
   (i) provide cushioning effect
   (ii) provide bearing area
   (iii) absorb shocks and vibrations
   (iv) act as a locking device

(f) Which key transmits power through frictional resistance only ?
   (i) Woodruff
   (ii) Kennedy
   (iii) Saddle
   (iv) Sunk

(g) Universal coupling is used to join two shafts
   (i) having lateral misalignment
   (ii) whose axes intersect at a small angle
   (iii) which are not in exact alignment
   (iv) which are perfectly aligned

2. Design and draw a cotter joint to support a load varying from 40 kN compression to 40 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically.

Tensile stress = Compressive stress = 50 MPa,

Shear stress = 35 MPa and

Crushing stress = 90 MPa. *14*

3. Discuss the various types of shafts and the standard sizes of transmission shafts.

Find the diameter of a solid steel shaft to transmit 22 kW at 200 r.p.m. The ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0·5. *14*

4. What do you understand by a column or strut ? Explain the various end conditions of a column or strut. *14*

5. A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity is 84 kN/mm^2, find the axial load which the spring can carry and the deflection per active turn. *14*

6. What are the basic functions of piston rings ? Discuss the design of piston for an internal combustion engine. *14*

7. (a) What are fits and tolerances ? How are they designated ? *7*

   (b) What is meant by 'hole basis system' and 'shaft basis system' ? Which one is preferred and why ? *7*

8. (a) Illustrate how the stress concentration in a component can be reduced. *7*

   (b) Explain how the factor of safety is determined under steady and varying loading. *7*