BME-060

DIPLOMA IN MECHANICAL ENGINEERING (DME)

Term-End Examination

ꠢꠢꠢꠢ   June, 2018

BME-060 : MACHINE DESIGN

Time : 2 hours   *Maximum Marks : 70*

*Note : Question no. 1 is **compulsory**. Answer any **four** questions from the remaining part. All questions carry equal marks. Use of scientific calculator is permitted.*

1. Select suitable alternative from the given choices in the following questions :   *7×2=14*

    (a) The material commonly used for machine tool bases is

        (i)   mild steel

        (ii) cast iron

        (iii) aluminium

        (iv) bronze

    (b) Rankine's theory is used for

        (i)   brittle materials

        (ii) ductile materials

        (iii) elastic materials

        (iv) plastic materials

(c) Eye bolts are used for

   (i)   transmission of power

   (ii) locking device

   (iii) absorbing shock and vibrations

   (iv) lifting and transporting heavy machines

(d) The property of a bearing material which has the ability to accommodate shaft deflections and bearing inaccuracies by plastic deformation without excessive wear and heating is known as

   (i)   bondability

   (ii) embeddability

   (iii) comfortablity

   (iv) fatigue strength

(e) A sliding bearing which operates without any lubricant is called

   (i)   zero film bearing

   (ii) boundary lubricated bearing

   (iii) hydrodynamic lubricated bearing

   (iv) hydrostatic lubricated bearing

(f) When two non-intersecting and non-coplanar shafts are connected by gears, the arrangement is known as

   (i)   spur gearing

   (ii) helical gearing

   (iii) bevel gearing

   (iv) spiral gearing

(g) Factor of safety for fatigue loading is the ratio of

(i) elastic limit to the working stress

(ii) Young's modulus to the ultimate tensile strength

(iii) endurance limit to the working stress

(iv) elastic limit to the yield point

2. (a) What is factor of safety ? Explain the basic reason for taking factor of safety while designing a machine element.   7

(b) Explain stress-strain diagram for ductile materials. What properties can you define with the help of this diagram ?   7

3. (a) What are the different types of welded joints ? Explain with suitable figure.   7

(b) A butt welded joint with ground and flush surface is subjected to a tensile load which varies from 25 kN to 75 kN. Plates are 10 mm thick. Determine the length of weld required for 200000 cycles.   7

4. (a) What do you understand by self-locking screws ? Explain.   7

(b) What are the factors to be considered while selecting a type of key ? List out the applications of keys.   7

5. (a) What is a coupling ? What are the functions of coupling ? How can it be classified ? Discuss. 7

(b) A 300 mm hand lever is fixed to a 40 mm diameter shaft by means of a taper pin passing through its hub and perpendicular to the axis. Calculate the mean diameter of the pin and maximum shear stress induced in the shaft. Take design stress in shearing as 40 N/mm². 7

6. (a) Why is taper provided in cotter ? What is the purpose of providing clearance 'c' in the cotter joint ? Elaborate. 7

(b) A shaft diameter 100 mm transmits a torque of 6 kN-m. A flanged coupling is keyed to the shaft by means of a key 28 × 16 × 100 mm long. The coupling has 6 bolts of 20 mm diameter arranged along a bolt pitch circle diameter (pcd) 30 mm. Calculate stresses induced in the shaft key and bolts. 7

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

(a) Bearing Material

(b) Hardening of Steel

(c) Annealing

(d) Universal Coupling

(e) AGMA and Indian Standards

(f) Fatigue