B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)
Term-End Examination
June, 2017

00584

BIME-011 : MACHINE DESIGN – II

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **five** questions. Question no. 1 is **compulsory**. Assume missing data suitably. Use of machine design data book and scientific calculator is permitted.*

1. Select the most appropriate answer and write it in the answer book.   7×2=14

    (a) Gears are made by casting process using

         (i)   sand mould casting

         (ii)   slush casting

         (iii) permanent mould casting

         (iv) centrifugal casting

    (b) The size of gears is usually specified by

         (i)   pressure angle

         (ii)   pitch circle diameter

         (iii) circular pitch

         (iv) diametral pitch

(c) A sliding bearing which can support steady loads without any relative motion between the journal and the bearing is called

  (i)   zero film bearing

  (ii) boundary lubricated bearing

  (iii) hydrostatic bearing

  (iv) hydrodynamic lubricated bearing

(d) In a partial journal bearing, the angle of contact of the bearing with the journal is

  (i)   120°

  (ii) 180°

  (iii) 270°

  (iv) 360°

(e) A spark plug gap is usually kept in the range of

  (i)   0·4 to 0·9 mm

  (ii) 0·2 to 0·8 mm

  (iii) 0·3 to 0·7 mm

  (iv) 0·6 to 1·0 mm

(f) The maximum shear stress theory is used for

  (i)   brittle materials

  (ii) ductile materials

  (iii) plastic materials

  (iv) non-ferrous materials

(g) The function of the washer is to

    (i) fill up the axial gap

    (ii) provide bearing area

    (iii) provide cushioning effect

    (iv) absorb shocks and vibrations

2. (a) Enlist different gear materials and specify their special characteristics.   7

   (b) Discuss different modes of failures with suitable illustrations.   7

3. (a) What is Lewis form factor ? How does the form factor vary with pressure angle and the number of teeth ? Describe in brief.   6

   (b) A pair of mating spur gears have 20° full depth of 4 mm module. The number of teeth on pinion and gear are 38 and 115 respectively. The face width is 40 mm. The pinion and gear are made of steel with core hardness of 200 and surface hardness of 300. Calculate the safe power that can be transmitted when the pinion is run at 1200 rpm.   8

4. Design a pair of steel helical gears of $14\frac{1}{2}$° involute profile having helix angle 45° to transmit 20 kW at 1440 rpm of pinion. The centre distance between the gears is to be close to 400 mm. The desired transmission ratio is 4 : 1, the gears are hardened to 450 BHN.   14

5. Design a suitable worm gear drive to transmit 5 kW at 1200 rpm. The speed ratio is to be 25 and the centre distance 250 mm. *14*

6. (a) A full journal bearing ($\beta = 360°$) having a diameter of 75 mm and length 125 mm supporting a load of 20 kW runs at 1000 rpm. The temperature of the bearing surface is not to exceed 76·7°C and the room temperature 37·8°C. The oil used has a viscosity of 10 cP at 115·6°C. Determine the amount of artificial cooling required. *10*

   (b) How do you select a good bearing material ? Elaborate. *4*

7. (a) How do you classify piston rings ? Discuss the function of piston rings. *7*

   (b) Why are connecting rod shanks usually of I-section ? What are the design considerations of crank pins ? Explain. *7*

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

   (a) Contact Ratio

   (b) Dynamic Load Factor

   (c) Herringbone Gear

   (d) Bearing Life

   (e) Crank Radius

   (f) Mounting of Bearing