B. TECH. VIEP-MECHANICAL
ENGINEERING (BTMEVI)
Term-End Examination
June, 2019
BIME-011 : MACHINE DESIGN—II

Time : 3 Hours   *Maximum Marks : 70*

Note : *Attempt five question in all. Question 1 is compulsory. Use of machine design data book and scientific calculator is permitted. Assume missing data suitably.*

1. Select the most appropriate answer :   2 each

    (a) The piston pin bearings in heavy duty diesel engines are :

    (i) Needle roller bearings

    (ii) Tapered roller bearings

    (iii) Spherical roller bearings

    (iv) Cylindrical roller bearings

    (b) In thrust bearings, the load acts :

    (i) Along the axis of rotation

    (ii) Parallel to the axis of rotation

    (iii) Perpendicular to the axis of rotation

    (iv) In any direction

(c) The length of the piston usually varies between :

   (i)   2.5 D and 3 D

   (ii) 2 D and 2.5 D

   (iii) 1.5 D and 2 D

   (iv) D and 1.5 D

   where D = diameter of piston.

(d) In worm gears, the angle between the tangent to the thread helix on the pitch cylinder and the plane normal to the axis of worm is called : ·

   (i)   Pressure angle

   (ii) Lead angle

   (iii) Helix angle

   (iv) Friction angle

(e) In helical gears, the distance between similar faces of adjacent teeth along a helix on the pitch cylinders normal to the teeth is called :

   (i)   Axial pitch

   (ii) Diametral pitch

   (iii) Normal pitch

   (iv) Module

(f) The size of gear is usually specified by :

(i) Pressure angle

(ii) Pitch circle diameter

(iii) Circular pitch

(iv) Diametral pitch

(g) When the length of the journal is equal to the diameter of the journal, then the bearing is said to be :

(i) Short bearing

(ii) Long bearing

(iii) Medium bearing

(iv) Square bearing

2. A pair of helical gears are to transmit 12 kW. The teeth are 20° stub in diametral plane, and have a helix angle of 45°. The number of teeth on pinion is 20, and it runs at 10,000 r. p. m. The teeth on gear is 80. If the gears are made of cast steel, having static strength of 100 MPa; determine the required face width. 14

3. Determine the dynamic load carrying capacity of a deep-groove ball bearing, with the least bore size, and which is required to resist a radial load of 4 kN, and an axial load of 3 kN. The shaft rotates at 14000 r. p. m. The bearing is required to be in operation for 12,000 hours.

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4. Design a connecting rod for four stroke petrol engine, with the following data :   14

   Piston diameter = 0.10 m; stroke = 0.14 m, length of connecting rod (centre to centre) = 0.315 m

   Weight of reciprocating parts = 18.2 N

   Speed = 1500 rev/min with possible over speed of 2500

   Compression ratio   = 4.1

   Probable maximum
      explosion pressure = 2.45 MPa

5. Two shafts 0.30 m apart transmitting 20 kW are to be connected by a steel pinion meshing with cast iron gears. The velocity ratio is to be 4 to 1 and the smaller gear is to run at 600 rev/min. The ultimate strength for the gear material is 168 MPa and the factor of safety is 4. Design the arms for the gear and find the diameter of the gear shaft.   14

6. Determine the main dimensions of a multi-collar thrust bearing for a propeller shaft of a 460 kW power marine oil engine. The engine runs at 220 rev/min, The shaft diameter is 0.15 m and the propeller has a pitch of 2.50 m. Assume a slip of 20%.   14

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

   (a) Mounting of bearing

   (b) Performance of an I. C. engine

   (c) Gear tooth proportions

   (d) Beam strength of helical gears

   (e) Gear manufacturing methods