B.Tech. MECHANICAL ENGINEERING (BTMEVI)

00723

Term-End Examination

December, 2012

BIME-011 : MACHINE DESIGN–II

Time : 3 hours   *Maximum Marks : 70*

Note: *Attempt* ***five*** *questions. Question No. **1** is **compulsory**. Use of Machine Design Data book and use of scientific calculator is **permitted**. Assume missing data if any.*

1.   Select the most appropriate answer and write it in the answer book.   **7x2=14**

(a)   The crank shaft in an internal combustion engine.

(i)   Is a disc which reciprocates in a cylinder

(ii)   Is used to retain the working fluid and to guide the piston

(iii)   Converts reciprocating motion of the piston into rotary motion and vice versa.

(iv)   None of the above

(b)   The length of the piston having diameter D usually varies between :

(i)   D and 1.5 D

(ii)   1.5 D and 2D

(iii)   2 D and 2.5 D

(iv)   2.5 D and 3 D

(c) For high speed engines, a rocker arm should be used having

  (i) Rectangular section

  (ii) I-section

  (iii) T- section

  (iv) circular section.

(d) The number of starts on the worm for a velocity ratio of 40 should be.

  (i) Single

  (ii) Double

  (iii) Triple

  (iv) Quadruple

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

  (i) Normal pitch

  (ii) Axial pitch

  (iii) Diametral pitch

  (iv) Module.

(f) The piston pin bearings in heavy duty diesel engines are.

  (i) Needle roller bearing

  (ii) Tapered roller bearing

  (iii) Spherical roller bearing

  (iv) Cylindrical roller bearing.

(g) The maximum energy that can be stored in a body due to external loading upto the elastic limit is called

(i) Resilience

(ii) Proof resilience

(iii) Strain energy

(iv) Modulus of resilience.

2. A pair of gears is to be designed for compact size. **14** Power to be transmitted is 20 kW at 1450 rpm of pinion and gear ratio is 4:1. Tooth profile is 20° stub. Take material for pinion C.S and material for gear C.I. Determine the module and necessary face width by using Lewis Equation.

3. Two precision cut forged steel helical gears have **14** 20° full depth involute teeth. The angle of helix is 23°. Other details are as follows :

Permissible static bending stress	=	100 MPa
Module	=	3 mm
Face width	=	300 mm
The speed of rotation of pinion	=	600 rpm
Gear ratio	=	3 : 1
Surface endurance strength	=	630 MPa

Find the transmitted load, Wear load and axial thrust. Also state whether design is safe.

4. A hardened steel worm rotates at 1500 rpm and **14** transmits power to a phosphor bronze gear. The transmission ratio is 15 : 1 and centre distance is 225mm. Find the power transmitted by the drive by considering all the design criteria. Take $K = 0.727$ for wear equation. Assume $14\frac{1}{2}^{\circ}$ full depth teeth.

5. A shaft of 100 mm diameter rotate at 1500 rpm **14** in a bearing of 120 mm length, load on the shaft is $W = 45$ kN. Operating Temperature To is 80°C. Take $T_A = 35°C$ (surrounding temperature)

$$\frac{ZN}{P} = 20 \times 10^{-6} \ ; D/C = 1000$$

Determine the coeffient of friction, pressure intensity, H_d (Heat dissipated), type of oil to be used.

6. A 6203 single row deep groove ball bearing has a **14** basic static load rating Co=4500 N and basic dynamic load rating C=7350 N. If it is subjected to radial load of 1350 N and axial load of 1260 N, what is the rated life with outer ring stationary.

7. (a) Discuss the design considerations for crank pin. **3½x4=14**

(b) Specify the reasons for use of tapered skirt for pistons.

(c) Explain the basic functions of piston rings

(d) State the function of a connecting rod of an internal combustion engine.

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