No. of Printed Pages : **4 + Drawing Sheet**

BIME-011

B.Tech. MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

June, 2012

BIME-011 : MACHINE DESIGN II

00125

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 : **7x2=14**

(a) The ultimate strength of steel in tension in comparison to shear is in the ratio of :

(i) 1 : 1 (ii) 2 : 1

(iii) 3 : 2 (iv) 2 : 3

(b) 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

(c) Resilience of a material is important when it is subjected to :

(i) combined loading

(ii) fatigue

(iii) thermal stress

(iv) shock loading

(d) If the longitudinal strain in a material is doubled in comparison to lateral strain, then ratio of modulus of rigidity to modulus of elasticity will be :

(i) 0.20 (ii) 0.25

(iii) 0.33 (iv) 0.40

(e) Maximum principal stress theory is applicable for

(i) ductile materials

(ii) brittle materials

(iii) elastic materials

(iv) all of the above.

(f) Factor of safety is the ratio of

(i) yield stress / working stress

(ii) tensile stress / working stress

(iii) compressive stress / working stress

(iv) bearing stress / working stress

(g) Which of the following tooth profiles can take very heavy load

(i) $14\frac{1}{2}^{\circ}$ composite system

(ii) $14\frac{1}{2}^{\circ}$ full depth involute system

(iii) 20° full depth involute system

(iv) $14\frac{1}{2}^{\circ}$ stub in volute system

2. In a spur gear drive the diameter of pinion is 80 mm and the centre distance is 160 mm. The power to be transmitted is 4.5 kW at 800 rpm of pinion. Using 20° full depth teeth and material for pinion a steel with permissible static stress of 200 Mpa and material for gear a steel with a permissible static bending stress of 150 Mpa, determine the necessary module and width of the teeth using Lewis Equation only. **14**

3. Two parallel shafts are connected by helical gears with 20° full depth teeth and helix angle of 15°. The material for both gears is forged steel with safe stress 140 MPa . The power to be transmitted is 40 kW at 1400 rpm of pinion. Design the gear with Lewis Equation and check for wear strength. Use BHN = 250 and gear ratio = 4.5 : 1 **14**

4. Design a worm and worm gear drive for a speed reduction by 25. Pinion (worm) rotates at 600 rpm and transmits 35 kW. **14**

5. Select a suitable bearing which is to operate at 1500 rpm, and is acted upon by a 8000 N radial load and 5000 N thrust load. The inner ring rotates, the load is steady and the service is continuous. The shaft diameter, from strength consideration, is 45 mm, and the life expectancy is 500 hrs. **14**

6. Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 rpm for an average life of 5 years at 10 hours per day. Assume uniform and steady load. **14**

7. (a) Discuss the design of piston for an internal combustion engine. **7+7=14**

   (b) Explain the various stresses induced in the connecting rod.