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

BIME-011

01110

B.Tech. MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

June, 2013

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 scientific calculator is **permitted**. Assume missing data (if any) suitably.*

1. Select the most appropriate answer. **7x2=14**

(a) According to Indian standard specifications, a grey cast iron designated by 'FG 200' means that the

(i) Carbon content is 2%.

(ii) Maximum compressive strength is 200 N/mm^2.

(iii) Minimum tensile strength is 200 N/mm^2.

(iv) Maximum shear strength is 200 N/mm^2.

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

(i) resilience

(ii) proof resilience

(iii) strain energy

(iv) modulus of resilience

(c) In spur gears, the circle from which the involute profile is generated, is called :

(i) pitch circle

(ii) clearance circle

(iii) base circle

(iv) addendum circle

(d) The transverse section of helical gear is identical to :

(i) bevel gear

(ii) spur gear

(iii) worm gear

(iv) None of above

(e) Which of the following is an anti - friction bearing ?

(i) Pedestal bearing

(ii) Collar bearing

(iii) Hydrostatic bearing

(iv) Needle bearing

(f) 305 bearing refers to :

(i) light series bearing with 10 mm bore

(ii) medium series bearing with 20 mm bore

(iii) medium series bearing with 25 mm bore

(iv) heavy series bearing with 30 mm bore.

(g) In an I.C engine; the piston is connected to the connecting rod, by :

(i) sleeve bearing

(ii) gudgeon pin

(iii) cap bolts

(iv) ball bearing

2. A pair of spur gears, having $14\frac{1^\circ}{2}$ involute full depth teeth is to transmit 12 kW at 300 r.p.m. of the pinion. The velocity ratio is 3 : 1. The static strengths of cast iron gear and steel pinion are 60 MPa and 105 MPa respectively. Determine the module, face width, and the pitch diameter of the gears. Also check for wear. 14

3. 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

4. Design 20° involute worm and gear to transmit 10 kW with worm rotating at 1400 r.p.m. and to obtain a speed reduction of 12 : 1. The distance between the shafts is 225 mm. **14**

5. 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 1400 r.p.m. The bearing is required to be in operation for 12000 hours. **14**

6. (a) Make a sketch to show the pressure distribution in a Journal bearing with thick film lubrication in axial and along circumference.

   (b) Explain the following terms as applied to Journal bearings :
   (i) Bearing characteristic number
   (ii) Bearing modulus

   (c) How do you express the life of a bearing ? What is an average life ? **4+4+6=14**

7. 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.