(Pages : 3) **B – 3446**

Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, December 2016
(2013 Scheme)
13.705 : DESIGN OF MACHINE ELEMENTS – II (M)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **all** questions from Part – **A**. **Each** question carries **4** marks.*
*2) Answer **one full** question from **each** Module in Part – **B**, **Each full** question carries **20** marks.*
*3) **Assume** any missing data suitably.*
*4) **Use** of approved design data hand book is **permitted**.*

PART – A

1. What is meant by interference in gears ? How it can be eliminated ?
2. What is meant by equivalent number of teeth in a helical gear ? Derive equation for the same.
3. Explain the stability of lubrication.
4. What are the functions of piston rings and explain the materials used for it ?
5. Derive equation for the torque developed in a single plate clutch considering uniform wear. **(5×4=20 Marks)**

PART – B

Module – I

6. It is required to design a pair of spur gears with 20° full depth involute teeth consisting of a 20 teeth pinion meshing with a 50 teeth gear. The pinion shaft is connected to a 25 KW, 1500 rpm electric motor. The starting torque of the motor can be taken as 150% of the rated torque. The material for the pinion is plain carbon steel Fe 410, while the gear is made of grey cast iron FG 200. Design the pair. **20**

7. A pair of bevel gear is required to transmit 25 KW at 650 rpm. The output shaft is running at 250 rpm and is at 75° to the input shaft. The pinion is of cast iron and gear is of phosphor bronze. Design the pair. **20**

P.T.O.

Module – II

8. Design a journal and bearing to support a load of 5000 N at 600 rpm using bronze backed Babbitt. The oil to be supplied is SAE 40. Also calculate the mass of lubricating oil, minimum oil film thickness, amount of artificial cooling required and rise in temperature. **20**

9. A single row deep groove ball bearing is used to support the lay shaft of a four-speed automobile gearbox. It is subjected to following loads in respective speed ratios :

Gear	Axial load (N)	Radial load (N)	% Time engaged
First Gear	3250	4000	1%
Second Gear	500	2750	3%
Third Gear	50	2750	21%
Fourth Gear	Nil	Nil	75%

The lay shaft is fixed to the engine shaft and rotates at 1750 rpm. The static and dynamic load carrying capacities of the bearing are 11600 and 17600 N respectively. The bearing is expected to be in use for 4000 hr of operation. Find out the reliability with which the life could be expected. **20**

Module – III

10. A single cylinder double acting steam engine delivers 187.5 KW at 100 rev/min. The maximum fluctuation of energy per revolution is 15 percent. The speed variation is limited to 1 percent either way from the mean. The mean diameter of the rim is 2.4 m. Design a cast iron flywheel for the engine. **20**

11. Design a mild steel connecting rod for a single cylinder spark ignition engine from the following data :

Diameter of piston : 0.106 m, Weight of reciprocating parts : 19.2 N, Length of connecting rod : 0.324 m, Stroke length : 0.15 m, Speed of the engine : 1600 rpm, Maximum explosion pressure : 2.29 MPa gauge. **20**

Module – IV

12. a) The piston rod of a hydraulic cylinder exerts an operating force of 10 KN. The friction due to piston packing and stuffing box is equivalent to 12% of the operating force. The pressure in the cylinder is 12 MPa. The cylinder is made of cast iron FG 200 and the factor of safety is 5. Determine the diameter and the thickness of the cylinder. **8**

b) A tube with 50 mm and 75 mm as inner and outer diameters respectively, is reinforced by shrinking a jacket of outer diameter 100 mm. The compound tube is to withstand an internal pressure of 35 MPa. The shrinkage allowance is such that the maximum tangential stress in each tube has same magnitude . Calculate :

i) The shrinkage pressure; and

ii) The original dimensions of the tubes. Assume E = 207 KN/mm^2. **12**

13. A cone clutch is used to connect an electric motor running at 1600 rpm with a machine that is stationary. The machine is equivalent to a rotor of mass 150 kg and radius of gyration as 250 mm. The machine has to be brought to the full speed of 1600 rpm from a stationary condition in 50 sec. The semi cone angle is 12.5°. The mean radius of the clutch is twice the face width. The coefficient of friction is 0.2 and the normal intensity of pressure between contacting surfaces should not exceed 0.1 N/mm^2. Assuming uniform wear criterion, calculate :

i) The inner and outer diameters,

ii) Face width of friction lining,

iii) The torque required to engage the clutch; and

iv) The amount of heat generated during each engagement of the clutch. **20**

(4×20=80 Marks)
