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M – 6543

Reg. No. :

Name :

Seventh Semester B.Tech. Degree Examination, December 2021

(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 interference in Gears?
2. What is meant by Equivalent number of teeth in Bevel Gear? Derive expression for the same.
3. Explain the importance of Bearing Characteristic Number.
4. What are the functions of Piston rings and explain the materials used for it.
5. Differentiate between thin shell and thick shell.

(5 × 4 = 20 Marks)

P.T.O.



PART – B

Module – I

6. A pair of 20° stub in volute tooth spur gear is to transmit 25KW at a speed of 400 rpm of the pinion. Speed ratio is 1:3 the pinion is made of steel, C30 (Heat treated) and the gear is made of cast iron grade 35 (Heat treated). Design the pair and check the design for safety. 20

OR

7. A pair of helical gears is to be transmit 38KW at 1700 rpm of the pinion. The velocity ratio is to be 4.25 and the helix angle is to be 30°. The gears are subjected to a heavy shock load of 24 hrs per day. Design the pair. 20

Module – II

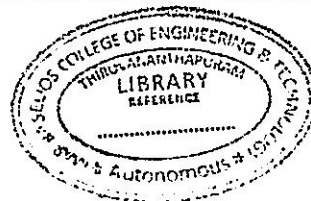
8. Design a journal bearing for the following specifications: Speed = 1600 rpm, Load=1300N C/D= 0.001: L/D = 1.6.P = 1.5 bar , Operating temperature = 65°C. Also calculate the mass of lubricating oil and rise In temperature. 20

OR

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 N 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 190KW at 100 rev /min. The maximum fluctuation of energy per revolution is 14 percent. The speed variation is limited to 1 percent either way from the mean. The mean diameter of the rim is 2.5 m. Design a cast iron flywheel for the engine **20**

OR

11. Design a connecting rod for four stroke petrol engine with the following data: Diameter of Piston = 8.8 cm, stroke = 12.5 cm, mass of reciprocating parts = 1.9 kg, length of connecting Rod = 34 cm, R.P.M = 3000, Compression ratio 6.8:1, Maximum explosion pressure = 36 bar **20**

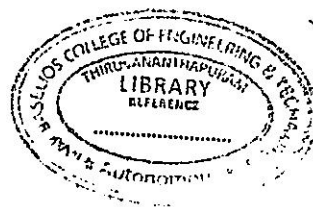
Module – IV

12. (a) Explain Dilation of Pressure vessels **3**
(b) Derive the expression for calculating power loss in friction in flat pivots. **5**
(c) 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 10% of operating force. The pressure in the cylinder is 10 MPa. The cylinder is made of cast iron with ultimate strength of 200 N/mm² and the factor of safety is 5. Determine the diameter and the thickness of the cylinder. **12**

OR

13. A centrifugal clutch transmitting 20KW at 900 rpm consists of four shoes. The clutch is to be engaged at 500 rpm. The inner radius of the drum is 165 mm. The radius of the centre of gravity of the shoes is 140mm, when the clutch is engaged. The coefficient of friction is 0.3, while the permissible pressure on friction lining is 0.1 N/mm². Calculate:

- (a) The mass of each shoe; and
(b) the dimensions of friction lining.



20

(4 × 20 = 80 Marks)

