(Pages : 4) **K – 4114**

Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, September 2020

(2013 Scheme)

13.705 DESIGN OF MACHINE ELEMENTS II (M)

Time : 3 Hours Max. Marks : 100

Design Data hand book permitted.

Assume missing data suitably.

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. Derive an expression for beam strength of a gear tooth.

2. Explain the mode of failure in worm gearing.

3. Differentiate between hydrodynamic lubrication and squeeze film lubrication.

4. Explain the considerations given in the design of pistons for IC engines.

5. Compare the stress distribution in thin and thick walled pressure vessels.

(5 × 4 = 20 Marks)

P.T.O.

PART – B

Answer **any one full** question from each module. **Each** questions carries **20** marks.

Module – I

6. Design a 20° involute worm gear for transmitting 11.25kW.The center distance between worm and worm wheel shafts is 0.25m and the speed reduction is 10.5:1.The worm shaft is rotating at 1200rpm. **(20)**

7. Design a bevel gear drive between two shafts whose axes are at right angles Speed of pinion shaft is 240 rev/min and that of the gear shaft is 120 rev/min. Pinion is to have 21 teeth of involute profile with module of 20mm and a pressure angle of 20° and is to be of suitable material. Gear is of cast iron. Power at gear shaft =75kW. **(20)**

Module – II

8. Design a journal bearing for a centrifugal pump running at 1440 rpm.Diameter of the journal is 10cm and the load on each bearing is 2000kg. Also calculate the minimum oil film thickness. **(20)**

9. A single-row deep groove ball bearing is subjected to a radial force of 8 kN and a thrust force of 3 kN. The shaft rotates at 1200 rpm. The expected life L_{10h} of the bearing is 20000 hours. The minimum acceptable diameter of the shaft is 75 mm. Select a suitable ball bearing for this application. **(20)**

Module – III

10. Design a center crank shaft for a single cylinder vertical engine using the following data:

Cylinder bore	= 125mm
l/r ratio	= 4.5
Maximum gas pressure	= 2.5MPa
Stroke length	= 150mm

Weight of the flywheel cum belt pulley = 1kN

Total belt pull = 2kN

Width of hub for flywheel cum belt pulley = 200mm

Allowable bending stress = 75MPa

Bearing pressure = 10MPa.

The torque on the crank shaft is maximum when the crank turns through 25° from the top dead center and at this position, the gas pressure inside the cylinder is on the piston is 2MPa.The belts are in the horizontal. **(20)**

11. Design an aluminium alloy piston for single acting four stroke engine from the following data :

Piston diameter = 90mm

Speed = 1500 rev/min

Length of stroke = 99mm

Mean effective pressure = $0.7N/mm^2$

b.s.f.c = 0.26kg/kWh

l/r ratio = 4

Calorific Value = 42 MJ/kg

Mechanical efficiency = 80%

Heat conducted through piston crown = 10% of heat generated during Combustion **(20)**

Module – IV

12. Design a centrifugal clutch for a belt drive from a shunt wound dc motor. The clutch is to be incorporated in the motor pulley and full spring control is required. The following data are specified.

Power (25% over load to be allowed) = 15kw

Speed = 720rpm

Engagement to begin at 75% of running speed

Number of shoes = 4

Outside diameter of Pulley = 35cm

Inside diameter of pulley rim = 32.5cm

Width of pulley = 25cm

Spring type = flat, rectangular section

Initial clearance between friction surfaces, when linings were new = 1.6mm

(20)

13. (a) A thick walled closed end cylinder has internal and external diameters as 200mm and 800mm.The cylinder is subjected to an internal fluid pressure of 150 MPa. If E=72GPa and $\mu = 033$, determine the principal stresses and maximum shear stress. Also find the increase in internal diameter due to fluid pressure. **(10)**

(b) Derive the expression for power lost in friction in a conical pivot. **(10)**

(4 × 20 = 80 Marks)