Code: 13A03604 **R13**

B.Tech III Year II Semester (R13) Regular & Supplementary Examinations May/June 2017

DESIGN OF MACHINE MEMBERS – II

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

Use of design data book is permitted in the examination hall

Assume necessary data if required

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1 Answer the following: (10 X 02 = 20 Marks)

(a) State any four assumptions made in deriving the expression for normal stress due to bending at the extreme fibers of a curved beam.

(b) What is creep in the belt?

(c) Define spring.

(d) What is the difference between bolt and screw?

(e) State the units of dynamic and kinematic viscosity in SI units.

(f) How is the bearing life is calculated?

(g) Define module.

(h) State any two assumptions made in the derivation of Lewis equation.

(i) Draw a neat sketch of piston.

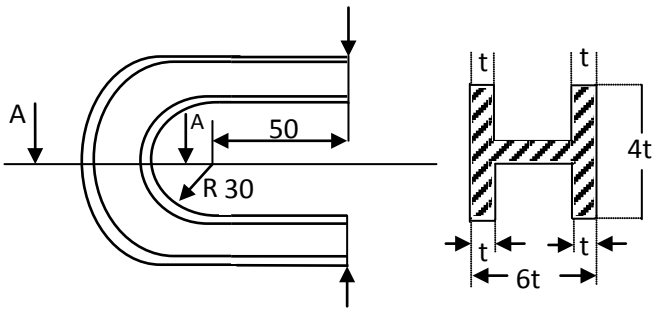
(j) Name some commonly used piston materials.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 The C frame of a 100 KN capacity press is shown in figure below. The material of frame is grey cast iron whose ultimate tensile stress is 200 MPA and FOS = 3. Determine the maximum stress at both inner fiber and outer fiber.



OR

3 Design a flat belt drive for a fan running at 360 rpm which is driven by a 10 kW, 1440 rpm motor. The belt drive is open type and space available for center distance is 2 m approximately.

UNIT - II

4 A compression spring made of alloy steel of coil diameter 75 mm and spring index 6.0, number of active coil 20 is subjected to a load of 1.2 kN. Calculate: (i) The maximum stress developed in the coil. (ii) The deflection produced. (iii) The spring rate.

OR

5 A 30 mm single start ACME power screw of 6 mm pitch has a thrust bearing of 40 mm mean diameter. The thread and bearing coefficients of friction are 0.15 and 0.1 respectively. (i) Estimate the torque required to raise a load of 200 kN. (ii) If the screw rotates at 2 Hz, determine the combined efficiency. (iii) Thread is lubricated to reduce the friction.

Contd. in page 2

UNIT - III

6 A journal bearing, 100 mm in diameter and 150 mm long; carries a radial load of 7 kN at 1200 rpm. The diametral clearance is 0.075 mm. Find the viscosity of the oil being used at the operating temperature, if 1.2 kW power is wasted in friction.

OR

7 A 310 deep groove ball bearing has a work cycle with 1000 rpm for one third of the time, 2000 rpm for the next one third of the time and 4000 rpm, for the last one third of the time. The outer race of the bearing rotates. Assume light shock condition. The radial load is 3.5 kN and axial load is 2 kN.

UNIT - IV

8 A helical cast steel gear with 30° helix angle has to transmit 35 kW at 1500 r.p.m. If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20° full depth teeth. The static stress for cast steel may be taken as 56 MPa. The width of face may be taken as 3 times the normal pitch. What would be the end thrust on the gear? The tooth factor for 20° full depth involute gear may be taken as $y = 0.154 - \frac{0.912}{T_E}$ where T_E represents the equivalent number of teeth.

OR

9 A motor shaft rotating at 1500 r.p.m. has to transmit 15 kW to a low speed shaft with a speed reduction of 3:1. The teeth are $14\,{}^{1}/_{2}{}^{0}$ involute with 25 teeth on the pinion. Both the pinion and gear are made of steel with a maximum safe stress of 200 MPa. A safe stress of 40 MPa may be taken for the shaft on which the gear is mounted and for the key. Design a spur gear drive to suit the above conditions. Also sketch the spur gear drive. Assume starting torque to be 25% higher than the running torque.

UNIT - V

10 Design a C.I. piston for a 4 stroke IC engine with the following specifications;
Cylinder bore = 90 mm; stroke length = 100 mm; maximum gas pressure = 4 MPa
Indicated mean effective pressure = 0.75 MPa; mechanical efficiency = 80%
Fuel consumption = 0.15 kg per BHP hour; higher calorific value of the fuel = 32 x 10^3 kJ/kg;
Speed 150 r.p.m.

OR

11 Design the I section connecting rod for a single cylinder IC engine; using the following specifications:
Diameter of the piston = 100 mm; Mass of the reciprocating parts = 2.25 kg
Length of the connecting rod = 300 mm; Stroke length = 125 mm; speed = 1500 rpm
Maximum explosion pressure = 3.5 MPa; Compression ratio = 7; Factor of safety = 7
Density of the rod material = 8000 kg/m^3; Yield stress in compression = 330 MPa.

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