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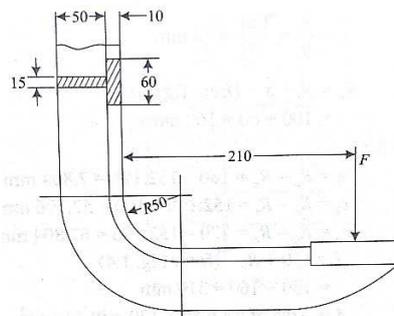
Sixth Semester B.E., Degree Examination, June 2018**DESIGN OF MACHINE ELEMENTS – 2 Model Question Paper - 2**

Time: 3 hours Max Marks: 80

1. Answer five full questions choosing one full question from each part.
2. Assume any missing data.
3. Use of Design Data Hand Books is permitted.

Module -1

- 1a Differentiate between straight and curved beams subjected to bending. (06 Marks)
- b Fig Q1(a) shows the frame of a punch press dimensioned in mm. Find the safe load that can be carried by the frame if the stress is not to exceed 120 MPa. (10 Marks)

**Fig Q1(a)**
OR

- 2a Determine the thickness of a flat steel plate for a cylinder of 100 mm diameter subjected to an internal pressure of 3 MPa and is supported at its circumference. The allowable stress for the material is 120 MPa. Also find the deflection in the plate. (08 Marks)
- b A steel cylinder having 75 mm outside diameter and 50 mm inside diameter is to be press fitted on to another cylinder of 50mm outside diameter and 25 mm inside diameter. The tangential stress at inside of inner cylinder is to be limited to 81 MPa. Modulus of elasticity is 210 GP. Poisson ratio is 0.3. Find and sketch the tangential and radial stresses induced.(08 Marks)

Module -2

- 3a A 10 mm thick and 120 mm wide flat belt is required to transmit power from a pulley of 120 mm diameter running at 720 rpm to another pulley to run at 240 rpm. The allowable stress for belt material is 2 MPa. Coefficient of friction is 0.33 and center distance between pulleys is 1.6 meters. Find the safe power that can be transmitted by this belt. (08 Marks)
- b Find the number of V belts required to transmit 15 kW from a pulley of diameter 125 mm rotating at 1200 rpm to another pulley to run at 500 rpm. The center distance is 1.4 m. The area of cross section of the belt is 400 mm². The allowable stress for the belt material is 1.75 MPa. The belt weighs 1 g / cc. (08 Marks)

OR

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- 4a A loaded narrow gauge car weighing 20 kN and moving with a velocity of 9 kmph is brought to rest by a bumper consisting of 4 helical springs. In bringing the car to rest, the spring undergo a compression of 300 mm. Allowable shear stress: 360 MPa. $G = 81$ GPa. Spring index: 5. Design a suitable spring. (08 Marks)
- b A truck spring has an overall length of 1.3 m. The width of central band is 150 mm. It carries a central load of 40 kN. The allowable stress is 450 MPa. The deflection under load is 90 mm. Take $E = 200$ GPa. Determine the width and thickness of the leaves, the camber and the load exerted on the band. (08 Marks)

Module -3

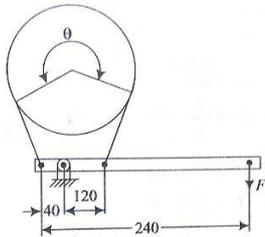
- 5 A 20 tooth 20° full depth involute spur gear pinion made of forged steel ($\sigma_o = 175$ MPa) is required to transmit 10 kW at 2000 rpm to a cast steel gear ($\sigma_o = 120$ MPa) to run at 500 rpm. Design the gears completely. (20 Marks)

OR

- 6 Design a pair of right angled bevel gears is to transmit 12.5 kW at 4000 rpm of steel pinion ($\sigma_o = 138$ MPa) having 24 teeth to a high grade Cast Iron gear ($\sigma_o = 103$ MPa) to run at 800 rpm. The teeth are $\frac{1}{2}^\circ$ involute. (16 Marks)

Module -4

- 7a Design a multi plate clutch to transmit 15 kW at 3000 rpm. (08 Marks)
- b Fig Q 7(b) shows a differential band brake operating on a drum diameter of 600 mm. The angle of contact is 225° . Coefficient of friction is 0.3. Find the operating force, size of the band and size of rectangular cross section of the lever. Assume CW rotation of the drum. (08 Marks)

**Fig Q 7(B)**

OR

- 8 Design a worm and worm wheel drive to transmit 3 kW at 3000 rpm of a hardened steel worm ($\sigma_o = 220$ MPa) to a phosphor bronze worm wheel ($\sigma_o = 120$ MPa). The center distance is to be 200 mm. The teeth are 20° FDI. (16 Marks)

Module -5

- 9 Design the main bearings of a steam turbine running at 1800 rpm. The diameter of journal is 40 mm. The load on the journal is 3 kN. Operating temperature of oil film is 60° C. (16 Marks)
- 10a Explain i) Static load capacity ii) Dynamic load capacity and iii) Life of a ball bearing. (06 Marks)
- b Select a deep groove ball bearing required to for a shaft of diameter 50 mm to withstand a radial load of 5 kN and a thrust load of 2 kN at a speed of 900 rpm. The bearing works for 40 hours per week for 2.5 years. (10 Marks)
