

Sixth Semester B.E. Degree Examination, June / July 2014
Design of Machine Elements – II

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Design data handbook is permitted.

PART – A

- 1 a. Determine the maximum tensile stress and maximum shear stress of the component shown in Fig. Q1(a) and indicate the location. **(10 Marks)**

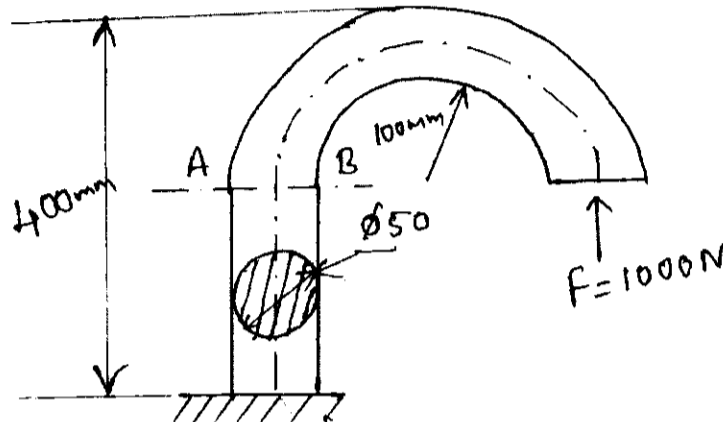


Fig. Q1 (a)

- b. A cast iron cylinder of internal diameter 200 mm and thickness 50 mm is subjected to a pressure of 5 N/mm². Calculate the tangential and radial stresses at the inner, middle and outer surface. **(10 Marks)**
- 2 a. A compressor is driven by a motor of 2.5 kW, running at 1200 rpm to a 400 rpm compressor. Select a suitable V-belt. **(10 Marks)**
 b. Explain Hoisting tackle mechanism to raise and lowering load for a rope. **(10 Marks)**
- 3 a. Derive an expression for the stress induced in a helical spring with usual notations. **(10 Marks)**
 b. Design a leaf spring for the following specification for a truck total load = 120 KN, number of springs = 4, material for the spring is chrome-vanadium steel permissible stress in 0.55 GPa. Span of spring = 1100 mm, width of central band = 100 mm and allowable deflection = 80 mm, number of full length leaves are 2 and graduated leaves 6. **(10 Marks)**
- 4 Design a pair of spur gear to transmit a power of 18 kW from a shaft running at 1000 rpm to a parallel shaft to be run at 250 rpm maintaining a distance of 160 mm between the shaft centres. Suggest suitable surface hardness for the gear pair. **(20 Marks)**

PART – B

- 5 A pair of bevel gear wheels with 20° pressure angle consists of 20 teeth pinion meshing with 30 teeth gear. The modulus is 4 mm while is 20 mm. The surface hardness of both pinion and gear is 400 BHN. The pinion rotates at 500 rpm and receives power from an electric motor. The starting torque of the motor is 150 percent of the rated torque. Determine the safe power that can be transmitted considering the dynamic load wear strength and endurance strength. The allowable bending stress may be taken as 240 MPa. **(20 Marks)**

- 6 a. A plate clutch with a maximum diameter of 600 mm has maximum lining pressure of 0.35 MPa. The power to be transmitted at 400 rpm is 135 kW and $\mu = 0.3$. Find inside diameter and spring force required to engage the clutch, if the spring with spring index 6 and material of spring the wire diameter if 6 springs are used. (10 Marks)
- b. The torque absorbed in the band brake shown in Fig. Q6 (b) is 400×10^3 Nmm. Design the band and lever taking $\mu = 0.27$ and diameter of drum as 400 mm. The allowable stress in band may be taken as 70 N/mm^2 . (10 Marks)

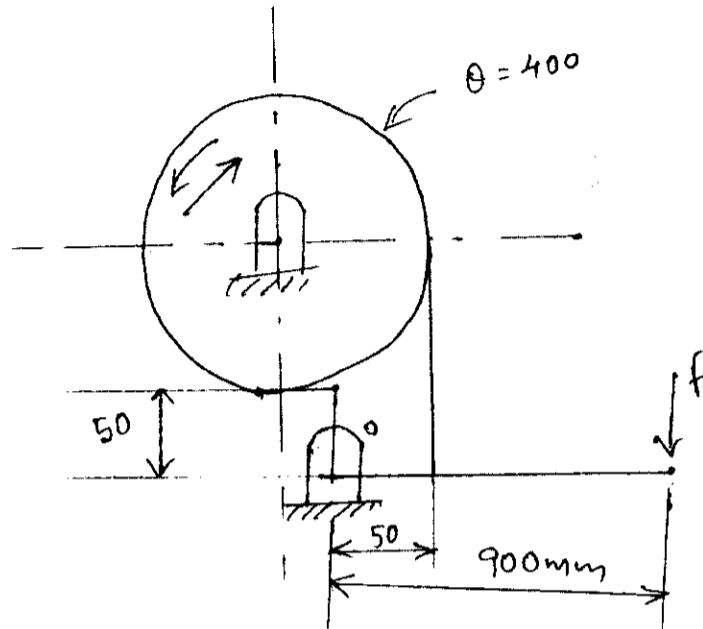


Fig. Q6 (b)

- 7 a. Derive Petroff's equation for co-efficient of friction in journal bearings. (08 Marks)
- b. Design the main bearing of a steam turbine that runs at 1800 rpm and 70°C . The load on the bearing is estimated to be 2500 N. (12 Marks)
- 8 Design a cast iron piston for a single acting four stroke diesel engine from the following data:
 Cylinder bore = 100 mm
 Length of stroke = 125 mm
 Speed = 2000 rpm
 Brake mean effective pressure = 0.5 MPa,
 Maximum gas pressure = 5 MPa,
 Fuel consumption = 0.25 kg/ Brake Power in kW/hour
 Assume any further data required for the design. (20 Marks)
