125 mm from the fixed pin. The straight brake arm is 750 mm long and is placed perpendicular to the diameter that bisects the angle of contact. Determine :

(i) Minimum pull necessary on the end of brake arm to stop the wheel if 40 kW is being absorbed.

(ii) Direction of rotation for the minimum pull.

(iii) Width of band 2 mm thick if maximum tensile stress in the band is not to exceed 50 N/mm^2.

Draw a neat dimensional sketch of the brake. 20

Unit – V

9. (a) What do you mean by hydrodynamic lubrication ? 4

(b) What are various types of lubricants used in bearings ? Define viscosity and viscosity index of a lubricant. 6

(c) Define Sommerfeld number. 3

(d) Where do we use thrust bearing ? Discuss different types of thrust bearing. 7

Or

10. A full journal bearing operates under a steady load of 2·5 kN at 6000 r. p. m. Design a satisfactory combination

(a) Length of bearing

(b) Diameter of bearing

(c) Lubrication oil

(d) Bearing material

Also find the power loss in the bearing and give a neat sketch of housing with bearing and shaft in position. 20

Total No. of Questions : 10] [Total No. of Printed Pages : 4

Roll No. .....

AU/ME–504(N)

B. E. (Fifth Semester) EXAMINATION, June, 2010

(New Scheme)

(Common for AU & ME Engg.)

MACHINE COMPONENT DESIGN

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt *five* questions in all selecting *one* question from each Unit. PSG Design Data book/Mahadevan Reddy's mechanical design data book is permitted in examination hall.

Unit – I

1. (a) What do you understand by stress concentration ? How can you minimize stress concentration ? 8

(b) A hot rolled steel shaft having $\sigma_u = 600$ MN/m^2, $\sigma_y = 450$ MN/m^2, $\sigma_e' = 300$ MN/m^2 is subjected to a bending moment which varies between 300 to 500 N-m and axial load which varies between 5 to 10 kN. Assuming that the bending moment and axial load are in phase, determine the diameter of the rod to have a factor of safety of 2. 12

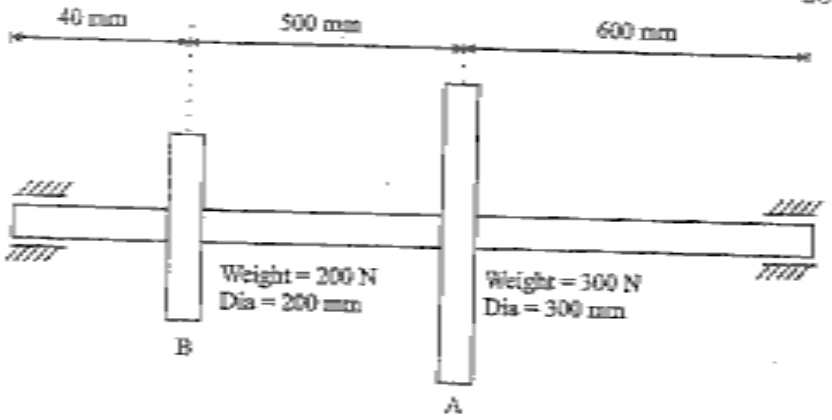
Or

2. (a) What do you understand by fatigue loading ? Discuss various types of fatigue stresses generally found in designing. 8

(b) Determine the wall thickness of a cylindrical pressure vessel of 1200 mm mean diameter subjected to an internal pressure that fluctuates between 5 N/mm^2 and 10 N/mm^2. Take σ_y = 200 N/mm^2 and FOS = 2. 12

Unit – II

3. A shaft 1·5 m long is supported on two bearings as shown in fig. carrying two flat pulleys. If the shaft receives 25 kW at pulley A and delivering the same power at pulley B, determine the diameter of the shaft assuming coefficient of friction for belts to be 0·30 and shaft speed to be 450 r.p.m., safe shear stress for shafts is 50 N/mm^2. 20



Or

4. (a) What is the function of a key ? Name different types of key used in power transmission. 5

(b) It is required to design a square key for fixing a gear on the shaft which transmits 10 kW power at 720 r. p. m. The shaft and key are both made of plain carbon steel C-45 and the factor of safety is 3·0. 15

Unit – III

5. (a) What is Wahl's correction factor ? 4

(b) Design a suitable spring for the exhaust valve of a petrol engine. The spring should be capable of exciting a net force of 360 N when the valve is open and 220 N when it is closed. The maximum inside diameter of the spring is 25 mm. The compression in spring is 8 mm. 16

Or

6. (a) What do you understand by power screw ? Which type of thread is generally used in power screw and why ? 6

(b) Design the screw of a screw jack suitable for a maximum load of 50 kN and having a lift of 225 mm. Assume suitable material and factor of safety. 14

Unit – IV

7. (a) What is the function of clutch ? List various types of clutches. 5

(b) A multiple disc clutch is to be designed for a machine tool. There are 8 driven discs having an outside diameter of 75 mm and inside diameter of 50 mm. The discs are of metal and run in an oil sparry. The coefficient of friction may be taken as 0·02 and the permissible unit pressure as 0·7 MPa. Determine the :

(i) axial pressure required.

(ii) the power that can be transmitted at 600 r. p. m. 15

Or

8. A simple bank brake operates on a drum 600 mm dia. and running at 200 r. p. m. The coefficient of friction is 0·25. The brake band has a contact of 270° and one end is fastened to a fixed pin and the other end to the brake arm