Unit - V

9. a) Differentiate between hydrodynamic bearings and hydrostatic bearings.

   b) A full journal bearing of 0.10m diameter by 0.15m long supports a radial load of 5500 N. The shaft speed is 500 rpm. The room temperature is 320°C and the surface of bearing is to be limited to 630 C. Select a suitable oil to satisfy the above requirements, if the bearing is well ventilated and no artificial cooling is to be used. Assume $D/Cd = 1000$.

OR

10. a) Define i) Rating Life   ii) Dynamic Load Rating.

    b) Select a single row deep groove ball bearing with the operating cycle listed below, Which will have a life of 15000 hours.

Fraction of Cycle	Type of Load	Radial Load (N)	Thrust Load (N)	Speed (RPM)	Service Factor
1/10	Heavy Shocks	2000	1200	400	3.0
1/10	Light Shocks	1500	1000	500	1.5
1/5	Moderate Shocks	1000	1500	600	2.0
3/5	No Shocks	1200	2000	800	1.0

Assume radial and axial load factors to be 1.0 and 1.5 respectively and inner race rotates.

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Roll No ....

AU/ME - 504

B.E. V Semester

Examination, December 2013

Machine Component Design

Time : Three Hours

Maximum Marks : 70

Note: All questions are compulsory. Assume suitable data, if necessary. Use of Design data book is permitted.

Unit - I

1. a) What is "Stress Concentration"? Define Fatigue Stress concentration factor and Index of sensitivity.

   b) What is the difference between Goodman line, Soderberg line and Gerber curve? Explain.

OR

2. a) What is endurance limit? Discuss factors affecting endurance limit of a machine part.

   b) A simply supported beam has a concentrated load at centre which fluctuates from a value of P to 4 P. The span of beam is 500mm and its cross section is circular with diameter of 60mm. Taking for beam material, an ultimate stress of 700 MPa, yield stress of 500 Mpa, endurance limit of 330 MPa for reversed bending and a factor of safety of 1.3, calculate the maximum value of P, using Soderberg relation and Goodman's relation. Take size factor of 0.85 and surface finish factor of 0.90.

Unit - II

3. a) What are different types of keys?

   b) A steel solid shaft transmitting 15kW at 200rpm is supported on two bearing 750mm apart and has two gears keyed to it. The pinion having 30 teeth of 5mm module is located 100 mm to the left of the right hand bearing and delivers power horizontally to the right. The gear having 100 teeth of 5mm module is located 150mm to the right of left hand bearing and receives power in a vertical direction from below. Using an allowable stress of 54MPa in shear, determine the diameter of the shaft.

OR

4. a) Compare the weight, strength and stiffness of a hollow shaft of same external diameter as that of solid shaft. The inside diameter of hollow shaft being half the external diameter. Both the shafts have same Material and length.

   b) It is required to design a bushed pin type flexile coupling to connect the output shaft of an electric motor to the shaft of a centrifugal pump. The motor delivers 20kW at 720 RPM. The starting torque of the motor is can be assumed to be 150% of the rated torque. Design the coupling and specify the dimensions of the components.

Unit - III

5. a) Define "Nipping". What do you understand by full length leave and graduated leaves of a leaf spring?

   b) Design a valve spring of a petrol engine for the following operating conditions:
   Spring load when valve is open = 400N,
   Spring load when valve is closed = 250N
   Maximum inside diameter of spring = 25mm
   Length of the valve when valve is open = 40mm,
   Length of the valve when valve is closed = 50mm,

OR

6. a) Derive the equation of efficiency of square threaded screw.

   b) What force will be required at a radius of 80 mm to raise and lower a 11 KN cross bar of a planer? The bar is raised and lowered by two 38 mm square thread screws having a pitch of 7 mm. The screw is of steel and nut is of bronze 38 mm thick. The collar is of steel and it has an outside diameter of 76mm and inside diameter of 38 mm. Take coefficient of friction at the threads as 0.11 and at the collar as 0.13.

Unit - IV

7. a) Differentiate between a clutch and a coupling. Give a brief classification of clutches.

   b) In a plate clutch the axial force is 4500 N. the inner radius of contact is 50 mm and outside radius is 100mm. Assuming uniform wear, determine:
   i) Maximum Pressure.
   ii) Minimum Pressure.
   iii) Average Pressure.

OR

8. a) Describe with the neat sketch the principle of operation of an internal expanding brake.

   b) A simple band brake operates on a drum of 600 mm in diameter that is running at 200rpm. The coefficient of friction is 0.25. The band brake has a contact angle of 270°, one end is fastened to a fixed pin and other end to the brake arm 125 mm from the fixed pin. The straight brake arm is 750 mm long and placed perpendicular to the diameter that bisects the angle of contact. What is the pull necessary on the end of the brake arm to stop the wheel, if 35kW is being absorbed? What is the direction