**Code :R520305**

III B.Tech II Semester(R05) Supplementary Examinations, April/May 2011
**DESIGN OF MACHINE MEMBERS-II**
(Mechanical Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE questions**
**All questions carry equal marks**
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1. Design a suitable journal bearing for a centrifugal pump from the following data:
   load on the bearing=13.5kN;
   diameter of the journal=80mm; speed=1440r.p.m. Bearing characteristic number at the working temperature
   ($75^0$C)=30; Permissible bearing pressure intensity
   =0.7N/mm$^2$ to 1.4N/mm$^2$; average atmospheric temperature =$30^0$C. Calculate the cooling requirements, if any.

2. Design a connecting rod of I -section for the engine having following data:
   Crank radius =300mm
   Connecting rod length=1800mm
   Speed of crank=400rpm
   Density of connecting rod material=0.008 kg/cm$^3$
   Neglect weight of reciprocating parts and assume suitable values for the stresses, etc. Connecting rod is made
   of C 40 steel.

3. With neat sketch explain the detailed design procedure of piston.

4. An open ring having T-Section as shown in figure 4 is subjected to a compressive load of 130 kN. Determine the
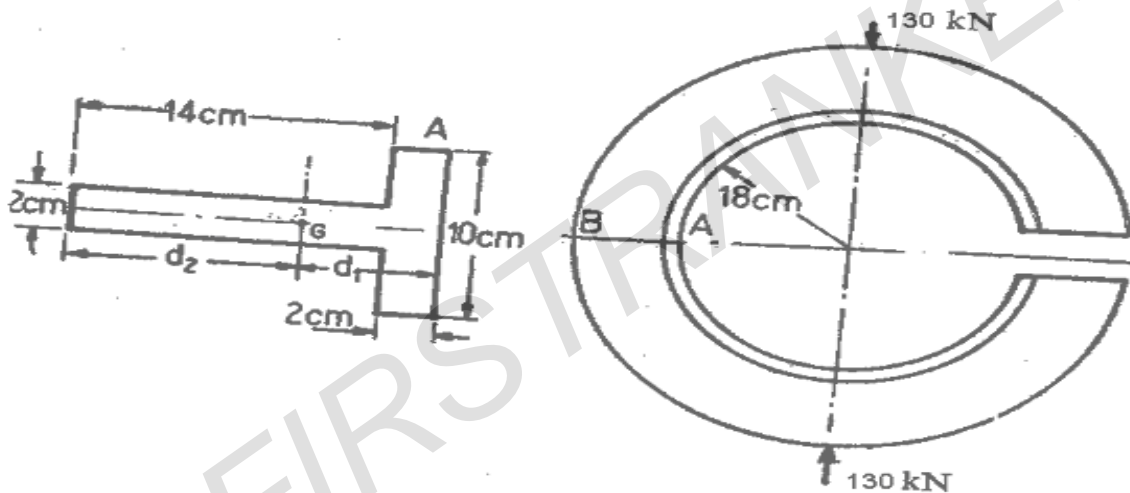   stresses at A & B.



Figure 4

5. (a) Classify the wire ropes, based on the direction of twist.
   (b) A rope drive is to transmit 250kW from a pulley of 1.2m diameter, running at a speed of 300 rpm. The
       angle of lap may be taken as $\pi$ radians. The groove half angle is $22.5^0$. The ropes to be used are 50mm
       in diameter. The mass of the rope is 1.3 kg per meter length and each rope has a maximum pull of 2.2kN,
       the coefficient of friction between rope and pulley is 0.3. Determine the number of ropes required. If the
       overhung of the pulley is 0.5m, suggest suitable size for the pulley shaft if it is made of steel with a shear
       stress of 40MPa.

6. A single stage helical gear reducer is to receive power from a 1440 r.p.m., 25kW induction motor. The gear tooth
   profile is involute full depth with $20^o$ normal pressure angle. The helix angle is $23^o$, number of teeth on pinion is
   20 and the gear ratio is 3. Both the gears are made of steel with allowable beam stress of 90MPa and hardness
   250B.H.N.
   (a) Design the gears for 20% overload carrying capacity from the standpoint of bending strength and wear.
   (b) If the incremental dynamic load of 8kN is estimated in tangential plane, what will be the safe power
       transmitted by the pair at the same speed?

7. (a) Differentiate between a compound screw and a differential screw.
   (b) A cross-bar of a planar, weighing 10kN is raised and lowered by means of two square threaded screws of
       40mm nominal diameter and 6mm pitch. The screw is made of steel and the nut of phosphor bronze, with
       42mm height. A steel thrust collar, with 36mm mean radius, takes the axial thrust. The coefficient of
       friction at the threads and the thrust collar may be taken as 0.15 and 0.12 respectively. Determine the force
       required at the radius of 125mm of a hand wheel, to raise and to lower the load. Also, determine shear
       stress induced in the nut, and bearing pressure induced on the threads.

8. (a) What are the basic requirements of a machine tools?
   (b) Explain the design procedure for Spindle.

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