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B.E. /B.Tech. (Full Time)DEGREE END SEMESTER EXAMINATION, APRIL/MAY 2011

AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH

FIFTH SEMESTER- (REGULATION 2008)

AI 9305 - DESIGN AND DRAWING OF AGRICULTURAL MACHINERY

Time: 3 hr

Max. Marks: 100

Instruction: Use of approved design data book is permitted

Answer ALL Questions

PART - A (10x 2= 20 Mark)

1. What is meant by allowable stress?
2. Define principal stress.
3. Where do you use V- belt?
4. What are the types of belts?
5. What are the advantages of chain drives?
6. Why are flexible couplings popular?
7. Which types of gear are used when the shafts are perpendicular to each other?
8. What is module?
9. What are the functions of bearing?
- 10 What are the four objectives of lubrication?

PART - B (5 x16 = 80 Mark)

- 11 A V-belt drive is required for a 15kW, 1440 rpm motor to a cutting machine running at 360 rpm for 24 hr per day. Space is available for a centre distances of approximately 1 m.Determine (i) the belt specifications, (ii) diameter of pulleys, (iii) the correct center distance and (iv) the number of belts. 16
- 12.a. Design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50 kN.The rods are co-axial and a small amount of angular movements between their axes is permissible. Design the joint and specify the dimensions of its components. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. 16
- Or
- 12.b. A propeller shaft is required to transmit 50 kW power at 600 rpm.It is hollow shaft,having inside diameter 0.8 times of the outside diameter.It is made of steel ($\sigma_y = 380 \text{ N/mm}^2$)and the factor of safety is 4.Calculate the inside and outside diameters of the shaft. Assume($\sigma_{sy}=0.5 \sigma_y$) 16

- 13.a. It is required to design a chain drive to connect a 15 kW, 1400 rpm electric motor to a drilling machine. The speed reduction is 3:1. The center distance should be approximately 500 mm. (i) Select a proper roller chain for the drive. (ii) Determine the number of chain links. (iii) Specify the correct center distance between the axes of sprockets. 16

Or

- 13.b. Design a protected type flexible coupling to connect a centrifugal pump and motor shafts. The input shaft transmits 7.5 kW power at 720 rpm to the output shaft through the coupling. The design torque is 150% of rated torque. Select suitable materials for various parts of the coupling, design the coupling and draw the components with dimension. 16

- 14.a. An electric motor is to be connected to a cutting shaft of a harvesting machine through a gear pair. The gears are overhanging in their shafts. Motor speed = 1440 rpm. Speed reduction ratio = 4. Motor power = 36 kW. The gears are to have 20° pressure angle. Design a spur gear drive. 16

Or

- 14.b. Design a straight bevel gear drive to transmit 30 kW. The speed of pinion is 400 rpm and of the gear is 150 rpm. 16

- 15.a. Following data is given for a 360° hydrodynamic bearing used for tractor shaft: 16

Radial load = 1500 N
Journal speed = 1400 rpm
Journal diameter = 50 mm
Static load on the bearing = 360 N

The value of surface roughness of the journal and the bearing are 2.5 and 1.5 micron respectively. The minimum oil film thickness should be five times the sum of surface roughness of the journal and the bearings. Determine:

- (i) length of the bearing;
- (ii) radial clearance;
- (iii) minimum oil film thickness;
- (iv) viscosity of lubricant; and
- (v) Flow of lubricant.

Select suitable oil for this application assuming the operating temperature as 70°C.

Or

- 15.b. A single-row deep groove ball bearing has a dynamic load capacity of 40500 N and operates on the following work cycle: 16

- (i) radial load of 5000 N at 500 rpm for 25% of the time;
- (ii) radial load of 10000 N at 700 rpm for 50% of the time; and
- (iii) radial load of 7000 N at 400 rpm for the remaining 25% of the time. Calculate the expected life of the bearing in hours.