

27/4/13

(12)

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATION, April / May 2013

Agricultural Engineering

Fifth Semester

AI – 9305 – Design and Drawing of Agricultural Machinery

(Regulation 2008)

(APPROVED DESIGN DATA BOOK PERMITTED)

TIME: 3 hrs

ANSWER ALL QUESTIONS

MAX MARKS: 100

Part – A (10×2=20 marks)

1. Why bending stresses are called as out of plane stresses?
2. Justify the role of polar moment of inertia in torsional equation.
3. Define – Crowning of a pulley
4. Draw the cross section of V – belt.
5. How a wire rope is designated?
6. Write the difference between rigid and flexible coupling.
7. State the law of gearing.
8. Define – Miter gears.
9. What is meant by antifricition bearings?
10. Draw the shaft hole assembly which represents interference fit.

Part – B (5×16=80 marks)

11. A hollow shaft is required to transmit 600 kW at 110 r.p.m, the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MPa and twist in a length of 3 meters not to exceed 1.4 degrees. Find the external diameter of the shaft, if the internal diameter to the external diameter ratio is 3/8. Take modulus of rigidity as 84 GPa.
12. (a) A leather belt 9 mm× 250 mm is used to drive a cast iron pulley 900 mm in diameter at 336 rpm. If the active arc on the smaller pulley is 120° and the stress in tight side is 2 MPa, find the power capacity of the belt. The density of leather may be taken as 980 kg/m³ and the coefficient of friction of leather on cast iron is 0.35.

OR

- (b) Design a V- belt drive to transmit 50 kW at 1440 rpm from an electric motor to a textile machine running 24 hrs a day. The speed of the machine shaft is 480 rpm.

13. (a) A workshop crane is lifting a load of 25 kN through a wire rope and a hook. The weight of the hook is 15 kN. The rope drum diameter may be taken as 30 times the diameter of the rope. The load is to be lifted with an acceleration of 1 m/s^2 . Calculate the diameter of the wire rope. Take a factor of safety of 6 and Young's modulus for the wire 80 kN/mm^2 . The ultimate stress may be taken as 1800 MPa. The cross sectional area of the wire rope may be taken as 0.38 times the square of the wire rope diameter.

OR

(b) Design a Muff coupling to transmit 6 kW at 13 rps. Design shear stress = 30 N/mm^2 for shaft and key. Shear stress for sleeve is 15 N/mm^2 . Crushing stress between shaft and key is 80 N/mm^2 .

14. (a) Design a spur gear drive to transmit 30 kW at 1440 rpm. Speed reduction is 2.5. Assume that the pinion and gear both are made of same materials.

OR

(b) Design a bevel gear drive to transmit 10 kW at 1440 rpm. Gear ratio $i = 3$. Material for pinion and gear – C 45 steel. Life = 10,000 hrs.

15. (a) Write short notes on the following.

- (i) Self-aligning bearing
- (ii) Static load carrying capacity of bearing
- (iii) Fits and tolerances
- (iv) Bearing material properties

OR

(b) A bearing for an axial flow compressor is to carry a radial load of 2500 N and thrust of 1500 N. The service imposes light shock and the bearing will be in use for 40 hours/week for 5 years. The speed of the shaft is 1000 r.p.m. Diameter of the shaft is 50 mm. Select suitable ball bearing.