

**B.Tech Odd Semester (CBCS) Exam.,
December—2017**

AGRICULTURAL ENGINEERING

(5th Semester)

Course No. : AECC-21

(Machine Design)

Full Marks : 50

Pass Marks : 15

Time : 2 hours

- Note :*
1. Attempt *any five* questions.
 2. Begin each answer in a new page.
 3. Answer parts of a question at a place.
 4. Assume reasonable data wherever required.
 5. The figures in the margin indicate full marks for the questions.

1. (a) Explain manufacturing consideration in design. 5
- (b) Find out diameter of the cylinder made of CGI-FG300 using Lamé's equation, if the maximum internal pressure is 30 MPa, FOS is 2 and internal diameter is 250 mm. 5

2. A shaft, as shown in Fig. 1 below. is subjected to a bending load of 3 kN, a pure torque of 1000 N-m and an axial pulling force of 15 kN. Calculate the stresses at A and B : 10

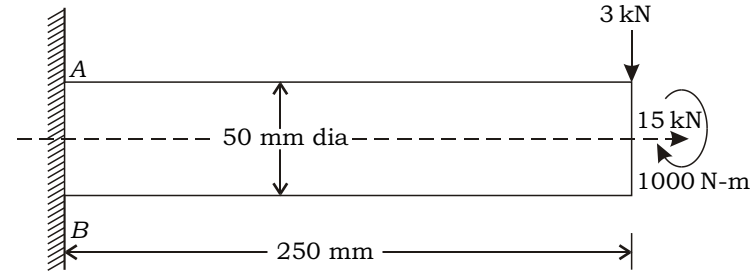


Fig. 1

3. A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9. The material properties of bar are given by—ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa. 10
4. A steel shaft is supported at bearing A and B 750 mm apart. A spur gear having PCD 400 mm is located 150 mm to the right of LH bearing and a pinion with PCD 120 mm is mounted 350 mm to the left of RH bearing.

(3)

The gear is driven by the pinion located vertically below, while the pinion transmits power to another gear horizontally to the right. Using allowable shear stress 60 MPa, determine the diameter of the shaft. The shaft is transmitting 10 kW at 200 r.p.m. Shock and fatigue factor in bending and torsion are 2.0 and 1.5 respectively. 10

5. (a) Explain different types of keys with neat sketches. 4
- (b) A steel plate, 80 mm wide and 10 mm thick, is joined to another steel plate by means of a single transverse and double parallel fillet welds as shown in Fig. 2 below. The strength of the welded joint should be equal to the strength of the plates to be joined. The permissible tensile and shear stresses for the weld material and the plates are 100 N/mm^2 and 70 N/mm^2 respectively. Find the length of each parallel fillet weld assuming tensile force passes through centre of gravity of three welds : 6

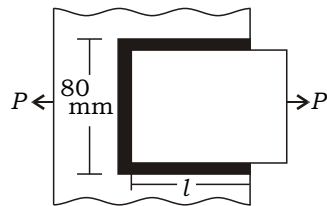


Fig. 2

(4)

6. Design a knuckle joint for a static load of 30 kN. Draw the failure diagrams. 10
7. (a) What is factor of safety? Discuss various factors to be considered while selecting the factor of safety. 5
- (b) Derive an expression for deflection of helical spring of circular wire. 5
8. (a) A laminated spring 500 mm long and 40 mm wide is held together at the centre by a band 85 mm wide. If the thickness of each leaf is 10 mm, find the number of leaves required to carry a load of 5400 N. Assume maximum working stress of 280 MPa. If the two of the leaves extend the full length of the spring, find the deflection of the spring. The Young's modulus for the spring material is 210 GPa. 8
- (b) Explain different thread profiles used in power screws. 2
