KERALA AGRICULTURAL UNIVERSITY

B.Tech (Agrl.Engg) Degree Programme 2014 Admission

IVth Semester-Final Examination-June/July-2016

Cat. No: Fpme.2210 **Marks: 50**

Title:Machine Design (2+1) **Time : 2 hours**

I. Fill in the blanks: **(10 x 1=10)**

1. The best design for the given objective function under the specified constraints is known as _____ design.
2. The property of material which enables it to be drawn in to wires with the application of tensile force is _____.
3. Steel containing Carbon up to 1.5% is known as _____ steel.
4. A load which is applied with some initial velocity is known as _____ load.
5. Rankine's theory of failure is used for _____ materials.

State True/False

6. The ratio of maximum stress to working stress is known as Factor of safety.
7. The ratio of maximum stress to the nominal stress is known as stress concentration factor.
8. When a material is subjected to repeated stresses, it fails at stresses below yield point stress. Such type of failure is known as creep.
9. A cotter joint is used to transmit twisting loads.
10. A key made from a cylindrical disc having segmental cross section, is known as gib head key.

II Answer the following any FIVE **(5 x 2=10)**

1. What are the general considerations in Machine Design?
2. Define the following properties of a material.

   a) Elasticity b) Plasticity c) Resilience
3. **Define.**

   a) Tensile stress b) Shear stress c) Strain
4. A Hydraulic press exerts a load of 3.5 MN. This load is carried by two rods, supporting the upper head of the press. If the safe stress is 85 Mpa and E = 210 kN/mm^2, find the diameter of the rods .
5. Sketch the two views of a knuckle joint and write the equation for failure of solid rod in tension and knuckle pin in shear.
6. An eye bolt is to be used for lifting a load of 60 kN. Find the core diameter of the bolt,if the tensile stress is not to exceed 100 MPa. Assume coarse threads.
7. What are the different types of belt drives?

III. Write short notes on ANY FIVE of the following **(5x 4=20)**

1. A hollow shaft for a rotary compressor is to be designed to transmit a power of 600 kW at 500 r.p.m. The maximum shear stress is 62.4 Mpa. Find the outside and inside diameter of the shaft, if the outer diameter is twice of the inside diameter,assuming that the maximum torque is 20% greater than the mean torque.
2. Design a rectangular key for a shaft of a diameter of 50 mm. The shearing and crushing stresses for the key material are 42 Mpa and 70 Mpa. (For a shaft of 50 mm diameter, the width of key is 16 mm and thickness = 10 mm.)
3. A helical spring is made from a wire of 6mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 Mpa and the modulus of rigidity is 84 kN/mm^2, find the axial load which the spring can carry and the deflection per active turn.
4. Discuss the procedure for design of a lever.
5. Two pulleys, one 450 mm and the other 200 mm diameters, on parallel shafts 1.98 m apart are connected by a cross belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt, when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient friction between the belt and the pulley is 0.25.
6. How are gears classified? Discuss important terminologies of spur gear drive.
7. What are anti friction Bearings? Write short note on classification and different types of anti friction bearings.

IV. Write essay on ANY ONE of the following **(1 x 10=10)**

1. Design and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 Mpa and crushing stress = 90 Mpa.
2. Design a leaf spring for the following specifications:

   Total Load = 140 kN; Number of springs supporting the load = 4; Maximum number of leaves = 10; Span of the spring = 1000 mm; Permissible deflection = 80 mm. Take Young's Modulus, E=200 kN/mm^2 and allowable stress in spring material as 600 Mpa.

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