Fpme.2104   Machine Design (2+0)

Marks: 50
Time: 2 hours

I   **Fill in the blanks**   (10x1=10)
1. Resistance of a material against any external force is termed as _____.
2. Property by virtue of which material can absorb strain energy without plastic deformation is called _____.
3. Friction welding is an example of _____ welding process.
4. Shafts are subjected to _____ forces.
5. The power transmitted by a belt is maximum when the maximum tension in the belt (T) is equal to _____.

State True or False
6. The property of a material to resist any elastic deformation is termed as hardness.
7. A knuckle joint is also called a Forked Pin Joint.
8. Saddle key is more suitable than sunk key for heavy duty application.
9. In leaf springs, the longest leaf is known as master leaf.
10. Due to slip of the belt, the velocity ratio of the belt increases.

II   **Write short notes on ANY FIVE of the following**   (5x2=10)
1. What are various theories of failures?
2. What are the disadvantages of welded joints?
3. List out the types of cotter joint.
4. A compression coil spring made of an alloy steel is having the following specifications: Mean diameter of coil = 50mm; Wire diameter = 5mm; Number of active coils = 20. If the spring is subjected to an axial load of 500 N. Calculate the maximum shear stress (neglect the curvature effect) to which the spring material is subjected.
5. Define critical speed of shaft.
6. An eye bolt is to be used for lifting a load of 60 kN. Find the nominal diameter of the bolt, if the tensile stress is not to exceed 100 MPa. Assume coarse threads.
7. Discuss on crowning of pulley.

III   **Answer ANY FIVE of the following**   (5x4=20)
1. Explain the classification of machine design and steps involved in designing a machine component.
2. A plate 100mm wide and 2.5mm thick is to be welded to another plate by means of parallel fillet welds. The plates are subjected to a load of 50 kN. Find the length of the weld so that the maximum stress does not exceed 56 MPa. Consider the joint first under static loading and then under fatigue loading.
3. List out the advantages of helical spring.
4. A shaft made of mild steel is required to transmit 100 kW at 300 rpm. The supported length of the shaft is 3 meters. It carries two pulleys each weighing 1500 N supported at a distance of 1 meter from the ends respectively. Assuming the safe value of stress, determine the diameter of the shaft.

5. What is the significance of 'slenderness ratio' in shaft design?
6. What are the failure modes of keys?
7. Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 rpm for an average life of 5 years at 10 hours per day. Assume uniform and steady load.

IV   **Write an essay on ANY ONE of the following**   **(1x10=10)**

1. Find the diameter of a solid steel shaft to transmit 20 KW at 200 rpm. The ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameter is 0.5.

2. Design a flat belt drive to transmit 22 kW, at 740 rpm to aluminium rolling machine. The speed ratio is 3. The distance between the centres of pulley is 3m; the diameter of aluminium rolling pulley is 1.2 m.

****