Fpme.2104   Machine Design (2+0)

Marks: 50
Time: 2 hours

I   **Match the Following**   (10x1=10)

1   The type design which needs no special knowledge or skill and can be attempted by designers of ordinary technical training is called as_____

2   _____is the mechanical property of a material opposite to ductility.

3   The transverse fillet welded joint is designed for _____strength.

4   A screw is specified by its_____

5   A cotter joint is used to transmit _____loads.

State TRUE or FALSE

6   Oldham coupling is used to connect two shafts which are perfectly aligned.

7   A keyway lowers both the strength and rigidity of the shaft.

8   The pitch diameter is the smallest diameter of an external or internal screw thread.

9   Two shafts will have equal strength, if twisting moment of both the shafts is same.

10   In leaf springs, the longest leaf is known as master leaf.

II   **Write Short notes on any FIVE of the following**   (5x2=10)

1   Types of loads

2   Condition for the transmission of maximum power in belt drives

3   Types of shafts and stresses induced in shafts

4   Uses of couplings and requirements of a good shaft coupling

5   Advantages and disadvantages of gear drive over belt drives.

6   Factors affecting selection of factor of safety to be used in designing of any machine part.

7   Strength of butt joints

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 soild circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10,000 nm. The shaft is made of 45C8 steel having ultimate tensile stress of 700 MPa and a ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of the shaft.

3   With neat sketches explain the types of welded joints.

4   Explain maximum shear stress theory of failure for a member subjected to biaxial stress.

5   Design the rectangular key for a shaft of 50 mm diameter by assuming thickness= 10 mm and width of key = 16 mm. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa

6   Two pulleys, one 450 mm diameter and the other 200 mm diameter, on parallel shafts 1.95 m apart are connected by a crossed 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 of friction between the belt and pulley is 0.25.

7   With neat sketch explain socket and spigot cotter joint.

IV   **Answer any ONE of the following**   **(1x10=10)**

1   With neat sketches explain the types of flat belt drives.

2   A shaft is supported by two bearings placed 1 m apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is 180° and μ = 0.24. Determine the suitable diameter for a solid shaft, allowing working stress of 63 MPa in tension and 42 MPa in shear for the material of shaft. Assume that the torque on one pulley is equal to that on the other pulley.

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