

**B.TECH. SEM -V MECHANICAL 2014 COURSE (CBCS) : WINTER .
2017**

Day: **Thursday** **SUBJECT: MACHINE DESIGN-I *** **02.30 PM TO 06.30 PM**
Date: **11/01/2018** **W-2017-2157** Time:
Max Marks: 60

N.B:

- 1)** All questions are **COMPULSORY**.
 - 2)** Figures to the right indicate **FULL** marks.
 - 3)** Assume suitable data if necessary.
 - 4)** Use of non- programmable **CALCULATOR** is allowed.
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Q.1 Explain aesthetic & ergonomic consideration in design with proper examples. **(10)**

OR

- a)** What are the requisites of design engineer?
- b)** Explain different standards used in mechanical engineering applications.

Q.2 Find the diameters of a solid steel shaft to transmit 20 kW at 200 r.p.m. The ultimate shear stress for the steel may be taken as 360 MPa & a factor of Safety as 2. **(10)**

If a hollow shaft is to be used in place of the solid shaft, find the inside & outside diameter when the ratio of inside to outside diameters is 0.5

OR

Design a shaft to transmit power from an electric motor to a lathe head stock through a pulley by means of a belt drive. The pulley weighs 200 N and is located at 300 mm from the centre of the bearing. The diameter of the pulley is 200 mm & the maximum power transmitted is 1 kW at 120 R.P.M. The angle of lap of the belt is 180° and coefficient of friction between the belt & the pulley is 0.3. The shock & fatigue factors for bending & twisting are 1.5 & 2 respectively. The allowable shear stress in the shaft may be taken as 35 MPa.

Q.3 In power screw, how to calculate torque to raise the load against thread friction. **(10)**

OR

A square threaded, triple start power screw used in a screw jack has a nominal diameter of 50 mm & a pitch of 8mm. The screw jack is used to lift a load of 7.5 kN. The coefficient of thread friction is 0.12 & collar friction is negligible. If the length of nut is 48mm calculate.

- i) Total torque
- ii) Maximum shear stress in screw body
- iii) Direct shear stress in screw & nut
- iv) Bearing pressure

State whether the screw is self-locking.

Q.4 a) What is nipping of leaf spring **(05)**

b) What is shot peening? **(05)**

OR

A helical spring is made from a wires of 6 mm diameter & has outside diameter of 75mm. If the permissible shear stress is 350 MPa & modulus of rigidity 84 kN/mm^2 , find the axial load which the spring can carry & the deflection.

P.T.O

Q.5 a) What are the advantages & disadvantages of welded joints over riveted joints? **(05)**

b) Draw a neat sketch of various types of Butt Joint. **(05)**

OR

A plate 100 mm wide & 12.5 mm 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 & then under fatigue loading.

Q.6 What are the causes of stress concentration explain methods of reducing stress concentration. **(10)**

OR

A steel bar of 50 mm diameter is subjected to a completely reversed bending stress of 250 N/mm^2 . The ultimate tensile strength of steel is 600 N/mm^2 . The surface finish factor & size factor are 0.43 & 0.85 respectively. The reliability factor is 0.897. Assuming there is no stress concentration, determine the life of the bar.

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