

Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

09/MS/23
EVENING

[Total No. of Questions: 09]

15 JUN 2023

[Total No. of Pages: 02]

Uni. Roll No.

Program: B.Tech. (Batch 2018 onward)

Semester: 5th

Name of Subject: Design of Machine Elements

Subject Code: PCME-111

Paper ID: 16377

Scientific calculator is Allowed

Design Data Book, PSG College of Engineering and Technology, Coimbatore is allowed.

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

- a) What are the methods of reducing stress concentration?
- b) What is endurance limit?
- c) Define Caulking and Fullering?
- d) Discuss the function of a coupling. Give at least two practical applications.
- e) Explain clearly the bearing stress developed at the area of contact between two members.
- f) What do you mean by factor of safety?

Part – B

[Marks: 04 each]

- Q2.** Which factors should be considered while selecting the material?
- Q3.** Draw the different types of keys with neat sketches. Discuss the design procedure for square key.
- Q4.** Elaborate the concept of concurrent engineering by giving an appropriate example.

15 JUN 2023

- Q5. A solid shaft is transmitting 1 MW at 240 r.p.m. Determine the diameter of the shaft if the maximum torque transmitted exceeds the mean torque by 20%. Take the maximum allowable shear stress as 60 MPa.
- Q6. A double riveted double cover butt joint in plates 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are:
 $\sigma_t = 120$ MPa;
 $\tau = 100$ MPa;
 $\sigma_c = 150$ MPa
Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear.
- Q7. Design a clamp coupling to transmit 30 kW at 100 r.p.m. The allowable shear stress for the shaft and key is 40 MPa and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolts is 70 MPa. The coefficient of friction between the muff and the shaft surface may be taken as 0.3.

Part – C**[Marks: 12 each]**

- Q8. Discuss the design of a Disc plate clutch considering uniform pressure along the radius.
OR
Discuss the advantages of using Rivets. Also describe the ways of failure of riveted joints.
- Q9. Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression.

OR

Design a right-angled bell crank lever. The horizontal arm is 500 mm long and a load of 4.5 kN acts vertically downward through a pin in the forked end of this arm. At the end of the 150 mm long arm which is perpendicular to the 500 mm long arm, a force P act at right angles to the axis of 150 mm arm through a pin into a forked end. The lever consists of forged steel material and a pin at the fulcrum. Take the following data for both the pins and lever material:

Safe stress in tension = 75 MPa

Safe stress in shear = 60 MPa

Safe bearing pressure on pins = 10 N/mm².
