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Uni. Roll No.

Program: B.Tech. (Batch 2018 onwards)

Semester: 5th

Name of Subject: Design of Machine Elements

Subject Code: PCME-111

Paper ID: 16377

Scientific calculator is allowed

MORNING

11 MAY 2023

Design Data Book for Engineers by PSG College, 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) Define 'Creativity'.
- (b) What is 'Factor of Safety'?
- (c) Explain function of the key.
- (d) Why couplings are used in machines?
- (e) Name any four types of rivets with sketch.
- (f) Enlist types of levers with sketch.

Part – B

[Marks: 04 each]

Q2. Explain design procedure of spigot and socket cotter joint.

Q3. Elaborate the concept of concurrent engineering by giving an appropriate example.

Q4. Enlist various steps to remove stress concentration in material/product with sketch.

Q5. Describe design procedure of sleeve/muff coupling.

Q6. Explain different properties of material in detail.

Q7. Differentiate flat belt, chain and spur gear drive in terms of their advantages, disadvantages and applications.

Part – C

[Marks: 12 each]

Q8. A flat belt is required to transmit 30 kW from a pulley of 1.5 m effective diameter running at 300 r.p.m. The angle of contact is spread over $11/24$ th of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine, taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 9.5 mm, density of its material is 1100 kg / m^3 and the related permissible working stress is 2.5 MPa.

Or

A foot lever is 1 m from the centre of shaft to the point of application of 800 N load. Find : 1. Diameter of the shaft, 2. Dimensions of the key, and 3. Dimensions of rectangular arm of the foot lever at 60 mm from the centre of shaft assuming width of the arm as 3 times thickness. The allowable tensile stress may be taken as 73 MPa and allowable shear stress as 70 MPa.

Q9. Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 m in diameter subjected to a steam pressure of 0.95 N/mm^2 . Assume joint efficiency as 75%, allowable tensile stress in the plate 90 MPa ; compressive stress 140 MPa ; and shear stress in the rivet 56 MPa.

Or

Design and draw a cast iron flange coupling for a mild steel shaft transmitting 90 kW at 250 r.p.m. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1° in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30 MPa.
