Dec. 2025

B.Tech. (ME) (Fifth Semester)

Design of Machine Elements-I (PCC-ME-503-21)

Time : 3 Hours] [*Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other. Use of Design Data Book is allowed.

Part A

1. (a) Differentiate between Disk and Band brakes. **1.5**

(b) What is the Master Leaf in a Leaf Spring ? **1.5**

(c) Differentiate between Helical and Torsion springs. **1.5**

(d) What are the various loads to which a shaft may be subjected to ? 1.5

(e) Name the different types of Keys. 1.5

(f) Differentiate between Rigid and Flexible couplings. 1.5

(g) What is Eccentric Loading in Riveted Joints ? 1.5

(h) Name the various types of Welded Joints. 1.5

(i) Define Factor of Safety. 1.5

(j) What is Fatigue Failure ? 1.5

Part B

2. Explain the design procedure for an Internally Expanding Brakes in detail. 15

3. (a) What is Surge in Springs ? Explain in detail. 5

(b) A standard splined connection 8 * 52 * 60 mm is used for the gear and the shaft assembly of a gearbox. The splines transmit 20 kW power at 300 rpm. The dimensions of the splines are as follows : **10**

Major diameter = 60 mm

Minor diameter = 52 mm

Number of splines = 8

Permissible normal pressure on splines is 6.5 N/mm^2. The coefficient of friction is 0.06.

Calculate :

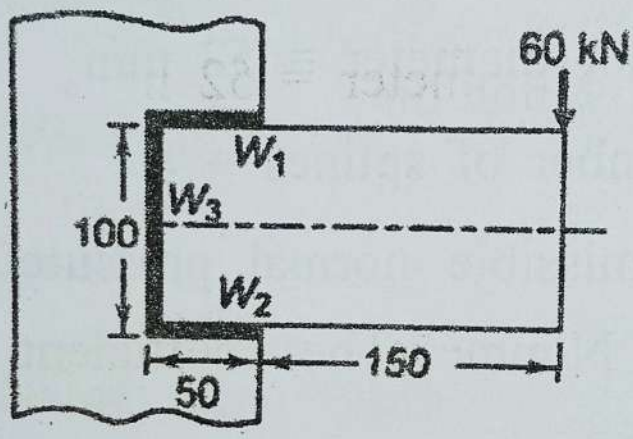
(i) The length of hub of the gear

(ii) The force required for shifting the gear

4. Explain the basic procedure for Machine Design with a flow chart in detail. **15**

5. A shaft, 40 mm in diameter, is transmitting 35 kW power at 300 rpm by means of Kennedy keys of 10 * 10 mm cross-section. The keys are made of steel 45C8 ($S_{yt} = S_{yc} = 380$ N/mm^2) and the factor of safety is 3. Determine the required length of the keys. **15**

6. A welded connection, as shown in Fig. is subjected to an eccentric force of 60 kN in the plane of the welds. Determine the size of the welds, if the permissible shear stress for the weld is 100 N/ mm^2. Assume static conditions. **15**



7. Explain the design procedure for a Cotter Joint in detail. **15**

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