Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐   **Total No. of Pages : 02**

Total No. of Questions : 07

B.Tech. (ME) (2011 Onwards)   (Sem.–5)
DESIGN OF MACHINE ELEMENTS-I
Code : BTME-501
Paper ID : [A2128]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.**

SECTION-A

Q1 Answer briefly :

a) Define the term *"Adaptive Design"*.

b) Differentiate between crushing and bearing stress.

c) Give the composition of 45C8 plain carbon steel.

d) What is stress concentration? What are the methods of reducing stress concentration?

e) What do you understand by term *'efficiency of a riveted joint'*?

f) Is hollow shaft stronger or weaker than a solid shaft of same diameter?

g) Differentiate between a cotter and key.

h) Explain the difference between rigid and flexible coupling.

i) Why a boss is generally needed at the fulcrum of the levers?

j) Enumerate the functions of seals and gaskets.

SECTION-B

Q2 a) Explain the procedure used to design a machine element.

b) Explain the factors which are considered in the selection of a material for a machine component.

Q3 Design and sketch the assembly of a knuckle joint to connect two mild steel rods subjected to an axial pull of l00kN. The allowable stresses for material are 100 MPa, 130 MPa and 60 MPa in tension, crushing and shear respectively.

Q4 A shaft made of mild steel is required to transmit 100 kW at 300 *r.p.m*. The supported length of the shaft is 3 metres. It carries two pulleys each weighing 1500 N supported at a distance of 1 metre from the ends respectively. Determine the diameter of the shaft, assuming allowable stress for shaft material 60 MPa. Use shock and fatigue factors for bending and torsion as 2 and 1.5 respectively.

Q5 Design the shaft, flange and bolt for a protected type flange coupling used to transmit 31.25 kW at 500 *r.p.m* from an engine to a machine. Assume following permissible stresses for the components of a coupling.

Shear stress for shaft   35 MPa

Shear stress for bolt   28 Mpa

Shear stress for cast iron   12 MPa

Q6 Design a right angled bell crank lever. The horizontal arm is 650 mm long and a load of 5000N acts vertically downward through a pin in the forked end of this arm. At the end of the 450 mm long arm which is perpendicular to the 650 mm long arm, a force P act at right angles to the axis of 450 mm arm through a pin into a forked end. Design the lever using the following permissible stresses: Tensile stress = 80 MPa; Shear stress = 45 MPa; Bearing pressure intensity = 10N/mm^2.

Q7 Explain the procedure for design of a square flanged pipe joint.