

Roll No.

OLE-24258

B. Tech. 5th Semester (ME) Examination – April, 2021 MECHANICAL MACHINE DESIGN - I Paper : ME-303-F

Time : Four Hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. **1** is *compulsory*. The use of following Design Data book is permitted :
(i) Design Data Handbook (In SI and Metric Units) for Mechanical Engineers by Mahadevan (ii) Design Data Book PSG College of Technology Coimbatore.

- 1.** Explain the following : $5 \times 4 = 20$
- (a) Principle of operation of clutch.
 - (b) What are different sections of arms of a flywheel ?
 - (c) What is the diamond arrangement of riveting ?
 - (d) Difference between loose, easy and close running fit.

UNIT – I

2. For easy push fit between the hand wheel and the shaft, the fit recommended is H7/j6. For a shaft of diameter 30mm, specify dimensions of hand wheel bore and shaft on which the hand wheel is fitted. 20
3. (a) Why is the fatigue strength of a forged part better than that of a cast part ? 10
- (b) What is factor of safety ? How it differs for forged and machined parts ? 10

UNIT – II

4. A load of 20kN is to be raised through a square-threaded power screw of normal series 30mm nominal diameter, single threaded. The nut is made of cast iron. If inner and outer collar radii are 8mm and 16mm, respectively, determine the torque to raise the load. The screw is made of steel. Is screw self locked. 20
5. A steam boiler drum is to be designed for internal pressure 25N/mm² and drum internal diameter 1.2 m. Determine thickness of steel sheet for boiler drum if $\sigma_{ta} = 80\text{MPa}$ and longitudinal efficiency is 55%. Design a double riveted lap joint if allowable stresses in rivets arc $\tau_a = 55\text{MPa}$ and $\sigma_{ba} = 110\text{Mpa}$. What is efficiency of circumferential joint ? 20

UNIT – III

6. In a roller chain drive, a driving sprocket with 17 teeth is transmitting power at 2300rpm to a machine with a speed reduction of 4. Choose a suitable chain. Determine minimum centre distance between sprockets. How many links will make the chain? 20
7. A rimmed flywheel is made of grey cast iron. Mean radius of rim is 1.2m, with breadth = 0.3m and thickness = 15mm. There are 6 arms in the flywheel. Determine: a) axial stress in arm if area of each arm is 25% of area rim, and b) tensile stress in rim if $\theta = 30^\circ$ and $\theta = 0^\circ$. The flywheel is rotating at 500rpm. 20

UNIT – IV

8. A particular clutch is designed to transmit 40kW at 100rpm. What is the expected capacity at 400 rpm? 20
9. A hoist is used to lower a load of 20kN at a speed of 1m/s, when the brakes are applied and load is brought to rest at a distance of 2 metres. Brake sheave of diameter 0.6m is mounted on drum shaft. Diameter of hoist drum is 1.0m. The kinetic energy of the drum is neglected. Determine a) braking capacity of a double shoe brake, and b) dimensions of brake lining if $pV = 1$, where p is pressure in MPa and V is velocity in m/s. 20