

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM  
(AUTONOMOUS)**

**III B.Tech II Semester Regular/Supplementary Examinations, April - 2024**

**DESIGN OF MACHINE MEMBERS – II  
(MECHANICAL ENGINEERING)**

Time: 3 hours

Max. Marks: 70M

**Answer ONE Question from each unit  
All Questions Carry Equal Marks  
Data Books are allowed**

| Q. No.            | Question  | BTL | CO  | Marks |
|-------------------|---|-----|-----|-------|
| <b>UNIT – I</b>   |   |     |     |       |
| 1.                | a) Explain the following terms with reference to journal bearing.<br>i) Coefficient of friction, ii) Heat generated by the bearing,<br>iii) Heat dissipated by the bearing.   | K2  | CO1 | 7M    |
|                   | b) In a particular application, the radial load acting on the ball bearing is 10kN and the expected life for 90% of the bearings is 9000hr. Calculate the dynamic load carrying capacity of bearing. When the shaft rotates at 1500 rpm.  | K3  | CO1 | 7M    |
| <b>OR</b>         |   |     |     |       |
| 2.                | A machine shaft supported on two identical taper roller bearings. Each bearing is subjected to a radial force of 30kN and thrust force 10kN. The thrust is taken by bearing alone. The shaft rotates at 300rpm. The expected life of the bearing is 4000Hr. The minimum acceptable diameter is 60mm. select suitable roller bearings for the shaft.   | K4  | CO1 | 14M   |
| <b>UNIT – II</b>  |   |     |     |       |
| 3.                | Design a cast iron piston for a single acting four stroke diesel engine with the following data:<br>Cylinder bore=200mm, Length of stroke = 250mm, Speed = 620rpm, Brake mean effective pressure=0.9Mpa, Maximum gas pressure = 4Mpa, fuel consumption=0.25kg/brake power/hour. Assume suitable data; take l/d ratio for bush as 1.5.   | K4  | CO2 | 14M   |
| <b>OR</b>         |   |     |     |       |
| 4.                | Design a connecting rod for a high speed I.C engine using following data:<br>Cylinder bore=125mm, Length of connecting rod= 300mm, Speed = 2200rpm, Maximum gas pressure=3.5Mpa, Length of stroke=125mm, mass of reciprocating parts=1.6kg. Assume suitable data.   | K4  | CO2 | 14M   |
| <b>UNIT – III</b> |   |     |     |       |
| 5.                | The nominal diameter of a triple threaded square screw is 50mm, while the pitch is 8mm. It is used with a collar having an outer diameter of 100mm and inner diameter as 65mm. The coefficient of friction at the thread surface as well as at the collar surface can be taken as 0.15. The screw is used to raise a load of 15kN, calculate i) Torque required in raising the load. ii) Torque required in | K3  | CO3 | 14M   |

|                  |   |    |     |     |
|------------------|---|----|-----|-----|
|                  | lowering the load. iii) The force required to raise the load, if applied at a radius of 500mm.  |    |     |     |
| <b>OR</b>        |   |    |     |     |
| 6.               | Derive an expression for stresses in a curved beam.   | K2 | CO3 | 14M |
| <b>UNIT – IV</b> |   |    |     |     |
| 7.               | It is required to select a flat belt drive for a compressor running at 600rpm, which is driven by a 22kW, 1400 rpm motor. Space is available for a centre distance of 2.8m. Assume the belt as open type.   | K4 | CO4 | 14M |
| <b>OR</b>        |   |    |     |     |
| 8.               | a) List out the advantages and disadvantages of chain drives over belt drives.  | K1 | CO4 | 7M  |
|                  | b) A rope drive transmits 600 kW from a pulley of effective diameter 4 m, which runs at a speed of 90 r.p.m. The angle of lap is 160°; the angle of groove 45°; the coefficient of friction 0.28; the mass of rope 1.5 kg / m and the allowable tension in each rope 2400 N. Find the number of ropes required.   | K3 | CO4 | 7M  |
| <b>UNIT – V</b>  |   |    |     |     |
| 9.               | A pair of straight teeth spur gears is to transmit 20 kW when the pinion rotates at 300 r.p.m. The velocity ratio is 1: 3. The allowable static stresses for the pinion and gear materials are 120 MPa and 100 MPa respectively. The pinion has 15 teeth and its face width is 14 times the module. Determine: 1. module; 2. face width; and 3. pitch circle diameters of both the pinion and the gear from the standpoint of strength only, taking into consideration the effect of the dynamic loading. | K4 | CO5 | 14M |
| <b>OR</b>        |   |    |     |     |
| 10.              | A pair of helical gears with 30° helix angle is used to transmit 15 kW at 10000 r.p.m. of the pinion. The velocity ratio is 4 : 1. Both the gears are to be made of hardened steel of static strength 100 N/mm <sup>2</sup> . The gears are 20° stub and the pinion is to have 24 teeth. The face width may be taken as 14 times the module. Find the module and face width from the standpoint of strength and check the gears for wear.   | K4 | CO5 | 14M |