

Code No: 126VD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech III Year II Semester Examinations, May - 2019****DESIGN OF MACHINE MEMBERS – II****(Common to ME, AME)****Time: 3 hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A**(25 Marks)**

- 1.a) What do you mean by hydrodynamic lubrication? [2]
- b) Why are ball bearings preferred to journal bearings for a shaft mounted on a gear box? [3]
- c) Why hollow piston pin is preferred to a solid one? [2]
- d) Enumerate the design considerations for crank pin. [3]
- e) What is meant by creep of a belt and what is its effect. [2]
- f) What are the simple and duplex rollers chains? [3]
- g) What is law of gearing? [2]
- h) What is the relation between the transverse and normal pressure angles and the helix angles? [3]
- i) What is differential screw? [2]
- j) What is acme thread? What is the difference between acme and trapezoidal threads? [3]

PART - B**(50 Marks)**

2. Design a full hydro dynamic journal bearing with following specifications for machine tool applications: Journal diameter =75mm, radial load=10kN, journal speed =1440 rpm, minimum film thickness =22.5 microns, inlet temperature =40 °C, bearing material =babbit. Determine the length of bearing and select suitable oil for this application. [10]
- OR**
3. A shaft rotating at 1440 rpm is supported by two bearings. The forces acting on each bearing are 6000N radial load and 3500 N axial thrust. If the shaft diameter is 40mm and the expected life of the bearing is 500h, select a suitable bearing if the required reliability of the bearing is to be 99percent. [10]
 4. Design an aluminum alloy piston for a single acting four stroke engine for the following:
Specifications:
Cylinder bore =0.30 m, Stroke=0.375 m, Maximum gas pressure =8 N/mm²
Brake mean effective pressure=1.15 MPa, Fuel consumption= 0.22 kg/KW/hr
Speed=500 rev/min. [10]
- OR**
5. Design a connecting rod of I cross section for an automobile diesel engine of the following specifications.
Diameter of cylinder=100mm, Stroke length =125mm, Maximum combustion pressure =2.8MPa, Maximum engine speed=2000rpm, Weight of the reciprocating parts =1.1kg, Length of connecting rod between centers=31.5cm, Assume an allowable crushing stress =3000kg/cm². [10]

6. An open belt connects to flat pulleys. The pulley diameters are 300mm and 450mm and the corresponding angles of the lap are 160° and 210° . The smaller pulley runs at 200 r.p.m. The coefficient of friction between pulley and belt is 0.25. It is found that the belt is on the point of slipping when 3 kW is transmitted. To increase the power transmitted two alternatives are suggested, namely (a) increasing the initial tension by 10%, and (b) increasing the coefficient of friction by 10% by the application of a suitable dressing to the belt. [10]

OR

7. It is required to design a chain drive to connect a 5 kW, 1400 rpm electric motor to a drilling machine. The speed reduction is 3:1. The center distance should be approximately 500mm. (a) select a proper roller chain for the drive (b) Determine the pitch circle diameters of driving and driven sprockets (c) determine the number of chain links (d) specify the correct center distance between the axes of sprockets. [10]

8. Design a pair of spur gear with stub teeth to transmit 55kW from 175 mm pinion running at 2500 rpm to a gear running at 1500 rpm. Both the gears are made of steel having B.H.N 260. Approximate the pitch by means of Lewis equation and then adjust the dimensions to keep within the limits set by the dynamic load and wear equation. [10]

OR

9. A helical cast steel gear with 30° helix angle has to transmit 35kW at 1500 r.p.m if the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20° full depth teeth, the static stress for cast steel may be taken as 56MPa. The width of the face may be taken as 5 times the normal pitch. What would be end thrust of the gear? The tooth factor for 20° full depth involute gear may be taken as $\left(0.154 - \frac{0.912}{T}\right)$, there T represents the equivalent number of teeth. [10]

10. In a machine-tool application, the tool holder is pulled by means of an operating nut mounted on a screw. The tool holder travels at a speed of 5m/min. The screw has single start square threads of 48mm nominal diameter and 8mm pitch. The operating nut exerts a force of 500N to drive the tool holder. The mean radius of the friction collar is 40mm. The coefficient friction at thread collar surfaces is 0.15. Calculate (a) Power required driving the screw and (b) the efficiency of the mechanism. [5+5]

OR

11. A vertical square threads screw of a 70 mm mean diameter and 10 mm pitch supports a vertical load of 50 k N. It passes through the boss of a spur gear wheel of 70 teeth which acts as a nut. In order to raise the load, the spur gear wheel is turned by means of a pinion having 20 teeth. The mechanical efficiency of pinion and gear wheel drive is 90%. The axial thrust on the screw is taken up by a collar bearing having a mean radius of 100 mm. The coefficient of friction for the screw and nut is 0.15 and that for collar bearing is 0.12. Find:
a) Torque to be applied to the pinion shaft,
b) Maximum principal and shear stresses in the screw; and
c) Height of nut, if the bearing pressure is limited to 12 N/mm². [3+3+4]