Code No: **19MET502**

R19

III B. TECH I SEMESTER REGULAR EXAMINATIONS, FEB-2022
DESIGN OF MACHINE MEMBERS-II
(MECHANICAL ENGINEERING)

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

Note: Answer **ONE** question from each unit **(5 × 12 = 60 Marks)**

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UNIT-I

1. a) Distinguish between hydrostatic and hydrodynamic bearings. [4M]

   b) Following data is given for 360^0 hydrodynamic bearing. [8M]
   journal diameter = 100mm, bearing length = 100mm, radial load = 50kN, journal speed = 1440rpm, radial clearance = 0.12mm, viscosity of lubricant = 16cP. Calculate (i) coefficient of friction (ii) power lost in friction.

(OR)

2. a) A certain application requires a bearing to last for 1800 hours with a reliability of 95%. What should be the rated life of the bearing selected for this application? [6M]

   b) A shaft rotating at a constant speed subjected to an equivalent radial load of 1663N. If the total life expected for the bearing is 20 million revolutions at 95% reliability, calculate the dynamic load rating of the bearing. [6M]

UNIT-II

3. Design a connecting rod for a four stroke petrol engine with the following data. Bore=80mm, Stroke=120mm, Weight of reciprocating parts=15N, Maximum speed=2800rpm, Length of connecting rod from center to center=240mm, Explosion pressure corresponding to 10^0 of crank angle = 3MPa, Compression ratio= 4:1, Factor of safety = 6, Yield stress in compression=330MPa. Assume suitable data if required. [12M]

(OR)

4. Design a single throw center crank shaft for a diesel engine. Other specifications are as follows. Bore=100mm, Stroke of piston=250mm Length of connecting rod=600mm, Speed of engine=1200rpm, Maximum gas pressure=1MPa, Maximum torque is experienced in the crank shaft when the crank angle is 30^0 from the inner dead center position. Permissible stresses for the crank shaft material are as follows. Bending= 70MPa, Shear=42MPa and Bearing=8MPa. Assume suitable data if required. [12M]

UNIT-III

5. Design a piston for a four-stroke diesel engine developing power at 1500rpm. Other related data are the following. Piston diameter =85mm, Stroke length =95mm, mean effective pressure = 0.7MPa, Basic specific fuel consumption=0.26kg/kW/hr, Heat conducted through the piston crown=10% of heat generated during combustion. Assume the piston is made of aluminum alloy. Assume suitable data if required. [12M]
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(OR)

6. a) Describe the various types of cylinder liners. [4M]

   b) A four stroke diesel engine has the following specifications. Brake power = 5 kW, Speed = 1200 rpm, Indicated mean effective pressure = 0.35 N/mm^2 , Mechanical efficiency = 80 %. Determine bore and length of the cylinder. [8M]

UNIT-IV

7. a) Differentiate stress distribution in curved and straight beams. [4M]

   b) Discuss the design procedure of crane hook. [8M]

(OR)

8. A pulley transmits 30kW at 240rpm. The belt drive is vertical and the angle of wrap is 180^0. The maximum stress in the belt material is 2.5MPa in 10mm thickness. The coefficient of friction between belt and pulley is 0.25. Sketch and design the pulley if the tension in the pulley rim is 4.5MPa. Take the shear stress of the shaft and key material is 50MPa. [12M]

UNIT-V

9. A spur gear drive is required to transmit a maximum power of 22.5kW. The velocity ratio is 2:1 and rpm of pinion is 200. The approximate centre distance between the shafts may be taken as 600mm. The teeth has 20^0 stub involute profile. The static stress for the gear material (cast iron) may be taken as 60MPa and face width as 10 times of module. Find module, face width and no. of teeth on each gear. [12M]

   Check the design for dynamic and wear loads. The deformation or dynamic factor in Buckingham equation may be taken as 80 and material combination factor for wear as 1.4.

   Take velocity factor, Cv = 3/(3 + V) (V is pitch line velocity in m/s)
   Lewis form factor, y = 0.175 – (0.841/T) (T is no. of teeth).

(OR)

10. Design a helical gear to transmit 15kW at 1440rpm to the following specification. Speed reduction is 3, Pressure angle is 20^0 and helix angle is 15^0. The material for both the gears is C45 steel. Allowable static stress is 180 N/mm^2, Surface endurance limit is 800 N/mm^2 and Young's Modulus of material is 2×10^5 N/mm^2. Assume suitable data if required. [12M]

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