Code No: R2032032 **R20** SET -1

III B. Tech II Semester Supplementary Examinations, December -2023
DESIGN OF MACHINE MEMBERS-II
(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Define bearing. Discuss about various types of sliding contact bearings. [4M]
   b) A taper roller bearing has a dynamic load capacity of 26 kN. The desired life for 90% of the bearings is 8000 h and the speed is 300 rpm. Calculate the equivalent radial load that the bearing can carry. [10M]

(OR)

2. a) Briefly discuss about full and partial bearings with neat sketch. [7M]
   b) A single-row deep groove ball bearing has a dynamic load capacity of 40500 N and operates on the following work cycle: [7M]
   (i) radial load of 5000 N at 500 rpm for 25% of the time;
   (ii) radial load of 10000 N at 700 rpm for 50% of the time; and
   (iii) radial load of 7000 N at 400 rpm for the remaining 25% of the time.
   Calculate the expected life of the bearing in hours.

UNIT-II

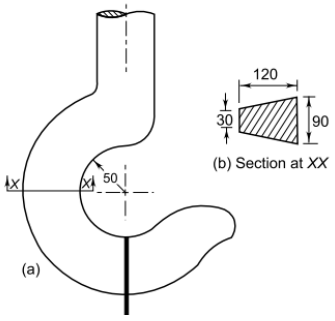
3. a) Write short note on cylinder liners. [4M]
   b) The cylinder of a four-stroke diesel engine has the following specifications: Brake power = 3.75 kW; Speed = 1000 rpm; Indicated mean effective pressure = 0.35 MPa; Mechanical efficiency = 80%; Determine [10M]
      (i) The bore and length of the cylinder
      (ii) Thickness of the cylinder head
      (iii) No. of studs, pitch diameter & nominal diameter of studs.

(OR)

4. Design a connecting rod for a high speed IC engine using the following data: Cylinder bore=125 mm; length of the connecting rod= 300mm; maximum gas pressure =3.5 MPa; Length of the stroke=125mm; Mass of reciprocating parts=1.6 kg; Engine speed= 2200 rpm. Calculate: [14M]
   (i) Cross section of the connecting rod
   (ii) Nominal diameter of bolts for the cap
   (iii) Thickness of the cap.

UNIT-III

5. a) A crane hook having an approximate trapezoidal cross-section is shown in Fig.1. It is made of plain carbon steel 45C8 (Syt = 380 N/mm^2) and the factor of safety is 3.5. Determine the load carrying capacity of the hook. [10M]



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b) Distinguish stress distribution in curved and straight beams [4M]

(OR)

6. a) Briefly discuss about various forms of threads. [6M]

b) A differential type of screw jack is shown in Fig. 2. In this construction, the two screws do not rotate and the nut is rotated by the operator by applying a force of 100 N at a mean radius of 500 mm. The coefficient of friction at the threads is 0.15. Calculate (i) the load that can be raised; and (ii) the efficiency of the screw jack. [8M]

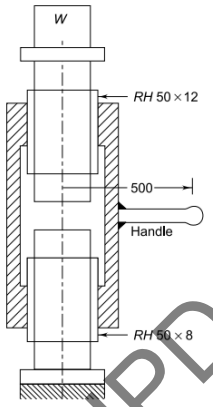

Fig.2

UNIT-IV

7. a) A roller chain is used to connect two shafts spaced 25 pitches apart to transmit 75 kW at 300 rpm of a 17 tooth driver sprocket to 34 tooth driven sprocket. The working period is 18 hours per day with abnormal service conditions. Specify the length and size of the chain. [7M]

b) A flat belt is required to transmit 30 kW from a pulley of 1.5m effective diameter running at 300 rpm. The angle of contact is spread over 11/24 of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine taking centrifugal tension in to account, width of the belt required. It is given that the belt thickness is 9.5 mm. density of belt material is 100 kg/m^3 and the permissible working stress is 2.5 MPa. [7M]

(OR)

8. A pair of cast steel annealed spur gears with cast teeth transmits 18.75 kW and 60 rev/min of the pinion. The pitch diameter of the pinion is approximately 0.23 m and the velocity ratio is 2.5. Determine the module and face of the gears; also the correct pitch diameters and tooth numbers. Check for dynamic and wear loads. [14M]

UNIT-V

9. A hand lever for a brake is 0.8 m long from the centre of gravity of the spindle to the point of application of the pull of 300 N. The effective overhang from the nearest bearing is 100 mm. If the permissible stress in tension, shear and crushing is not to exceed 66 MPa, design the spindle, key and lever. Assume the arm of the lever to be rectangular having width twice of its thickness [14M]

(OR)

10. a) Design a wire rope for a vertical mine hoist to lift a load of 50 kN, from a depth of 250 m. rope speed of 8 m./s is to be attained in 18 seconds. Take factor of safety as 6. Assuming suitable data if necessary. [10M]

b) Explain various types of stresses induced in the wire ropes. [4M]