

Reg. No:

--	--	--	--	--	--	--	--	--	--

SIDDHARTH INSTITUTE OF ENGINEERING &amp; TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year II Semester Supplementary Examinations July-2021

DESIGN OF MACHINE ELEMENTS-II

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

Note: Design data books are permitted for examinations.

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- 1 a Name the type of stresses induced in the wire ropes. 4M  
 b A belt drive consists of two V-belts in parallel, on grooved pulleys of the same size. 8M  
 The angle of the groove is  $30^\circ$ . The cross-sectional area of each belt is  $750 \text{ mm}^2$  and  $\mu = 0.12$ . The density of the belt material is  $1.2 \text{ Mg / m}^3$  and the maximum safe stress in the material is  $7 \text{ MPa}$ . Calculate the power that can be transmitted between pulleys of  $300 \text{ mm}$  diameter rotating at  $1500 \text{ r.p.m.}$  Find also the shaft speed in  $\text{r.p.m.}$  at which the power transmitted would be a maximum.

OR

- 2 a What are the assumptions made in Winkler-Bach theory? 4M  
 b A curved bar of circular cross section  $100 \text{ mm}$  in diameter has a radius of curvature of  $25 \text{ mm}$  at the inner fibers. The bending moment acting on the bar causes a tensile stress of  $20 \text{ N/mm}^2$  in the inner fibers. What will be the stress in the outer fibers? 8M

**UNIT-II**

- 3 a Distinguish between full journal bearing and partial journal bearing. 4M  
 b A  $75 \text{ mm}$  journal bearing  $100 \text{ mm}$  long is subjected to  $2.5 \text{ kN}$  at  $600 \text{ rpm}$ . If the room temperature is  $24^\circ\text{C}$ , what viscosity of oil should be used to limit the bearing surface temperature at  $55^\circ\text{C}$ .  $d/c=1000$ . 8M

OR

- 4 a Write notes on bearing life. 4M  
 b The radial load on a roller bearing varies as follows. A load of  $50 \text{ kN}$  is acting 20% of time at  $500 \text{ rpm}$  and a load of  $40 \text{ kN}$  is acting 50% of the time at  $600 \text{ rpm}$ . In the remaining time the load varies from  $40 \text{ kN}$  to  $10 \text{ kN}$  linearly at  $700 \text{ rpm}$ . Select a roller bearing from NU22 series for a life of at least  $4000 \text{ hours}$ . The operating temperature is  $175^\circ\text{C}$ . 8M

**UNIT-III**

- 5 a What are the advantages of dry liners? 2M  
 b A four-stroke diesel engine has the following specifications: Brake power =  $6 \text{ kW}$ , 10M  
 speed =  $1000 \text{ rpm}$ , indicated mean effective pressure =  $0.45 \text{ N/mm}^2$ , mechanical efficiency =  $85\%$ . Determine: (i) Bore and length of the cylinder. (ii) Thickness of cylinder head. (iii) Size of studs for the cylinder head

OR

- 6 a Explain the design consideration for the big end and small end of connecting rod. 6M  
 b What are the materials of the piston pin bearings and the crank pin bearings? 6M  
 Explain.

**UNIT-IV**

- 7 a List out the functions of springs with suitable examples. 4M  
 b A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm<sup>2</sup>, find the axial load which the spring can carry and the deflection per active turn. 8M

**OR**

- 8 a What is concentric spring? 2M  
 b A semi-elliptical laminated vehicle spring to carry a load of 6000 N is to consist of seven leaves 65 mm wide, two of the leaves extending the full length of the spring. The spring is to be 1.1 m in length and attached to the axle by two U-bolts 80 mm apart. The bolts hold the central portion of the spring so rigidly that they may be considered equivalent to a band having a width equal to the distance between the bolts. Assume a design stress for spring material as 350 MPa. Determine:  
 (i) Thickness of leaves. (ii) Deflection of spring. (iii) Diameter of eye. (iv) Length of leaves. (v) Radius to which leaves should be initially bent. 10M

**UNIT-V**

- 9 a Explain how the effect of dynamic load is considered in spur design. 4M  
 b A pair of straight spur gears is required to reduce the speed of shaft from 500 to 100 rpm while continuously running 12hr per day. The pinion is of 40C8 steel and has 20 teeth. The wheel is of cast iron of grade FG200 and has 100 teeth. The gears are of 8mm module, 100 mm face width and 20° pressure angle. Calculate power rating. 8M

**OR**

- 10 a What are the advantages of helical gears over spur gears? 4M  
 b A pair of helical gears in a milling machine is used to transmit 4.5 kW at 1000 rpm of the pinion and the velocity ratio is 3:1. The helix angle of the gear is 15° and both gears are made of steel C45. The gears are 20° FDI and the pinion is to have minimum of 20 teeth. The gear is to work 8 hr /day for 3 years. Design the helical gears. Take the required hardness for both gears is more than 350 BHN. 8M

\*\*\* END \*\*\*