5/15/24, 9:01 AM

Exam Date & Time: 06-Jan-2024 (02:30 PM - 05:30 PM)



MME 3155

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B.TECH END SEMESTER MAKEUP EXAMINATIONS, JAN 2024 DESIGN OF MACHINE ELEMENTS [MME 3155]

Marks: 50

A)

2)

Duration: 180 mins.

А

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

- 1) Determine the maximum value of stress at the hole and semicircular notch as shown in Fig.1. Take the thickness of plate as 25 mm.

 - B) A filleted plate with a circular hole subjected to tensile force of 5kN shown in Fig.2. The ultimate tensile strength of the plate material is 200 MPa. Determine the thickness of the plate. Take factor of safety as 2.5.



- C) Explain how to estimate stress concentration factor.
- Design a shaft required to transmit 200 kw at 350 rpm. The supported length of the shaft is 3 meters. It carries two pulleys each weighing 1500N supported at 1 meter from the ends respectively. Assuming safe shear stress of 60 MPa, Determine the diameter of the (5) shaft according to maximum shear stress theory.
- B) Estimate the torque transmitted by the shaft if it transmits 100 kw power at 300rpm.

(3)

(2)

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C)	Explain estimation of shear stress for design of shaft subjected when subjected combined bending and torsion according to ASME code.	(2)
3)	Design a journal bearing to support a load of 7kN radial load at journal rotates at 700 rpm. The material of the journal hardened steel and babbitt bearing. The oil has a specific gravity of 0.9 at 15 C and viscosity of 9 centistokes at 82C is taken as the limiting temperature of oil. Assume a clearance of 0.003 mm per mm diameter	(5)
A)	mining temperature of on. Assume a clearance of 0.005 min per min diameter.	
B)	Analyze the heat generated and dissipated in the bearing designed as per data in Question number 3A	(3)
C)	With an example explain the designation of antifriction bearing by 4-digit number.	(2)
4)	Design a helical compression spring to carry a load of 1000N with deflection of 25 mm, the spring index may be taken as 8. allowable shear stress of the spring material is 450 MPa and modulus of rigidity 84 GPa.	(5)
A)		
B)	Write the Lewis beam strength equation and explain it for gear tooth	(3)
C)	Explain different types of antifriction bearings	(2)
5)	Design a pair of spur gear with 20° full depth involute teeth to transmit 10 kW power with a gear ratio of 3:1. The number of teeth on pinion is 20 and it runs at 600 RPM. The pinion is made of cast steel, heat treated, and the gear is made of phosphor bronze.	(5)
A)		
B)	Analyse the wear load and dynamic load for spur gear designed as per data given in question 5A.	(3)
C)	Select a suitable roller bearing for a shaft of 60 mm diameter at 960 rpm. It has been used for 8 hr./day for 3 years and fully utilized. Radial load on the bearing is 5kN.	(2)

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