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SET - 1

III B. Tech I Semester Supplementary Examinations, June/July-2022
AUTOMOTIVE COMPONENTS DESIGN
(Automobile Engineering)

Time: 3 hours   Max. Marks: 75

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

1. a) Explain about the basic procedure of Design of machine elements [8M]
   b) Demonstrate the criteria for selection of materials in machine design and mention some of the important materials suitable for machine elements. [7M]

(OR)

2. a) What is meant by (i) Stress concentration   (ii) Fatigue loading (iii) Endurance limit and   (iv) Factor of safety [8M]
   b) Explain about S-N curve and how it is useful in fatigue analysis. [7M]

UNIT-II

3. a) Discuss briefly how the stresses can be calculated when the shafts subjected to combined torsional, bending and axial loading. [8M]
   b) A mild steel shaft transmits 20 kW at 2000 rpm. It carries a central load of 900 N and it is simply supported between the bearings 2.5 m apart. Determine the size of the shaft if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress is not to exceed 56 MPa. [7M]

(OR)

4. a) Discuss the method of determining stresses when the shaft subjected   (i) pure torsional load and   (ii) pure bending load. [8M]
   b) A machinery shaft is subjected to torsion only. The bearings are 2.4 m apart. The shaft transmits 187.5 kW at 200 rev/min. Allow a shear stress of 42 MPa after an allowance for keyways. [7M]
      (i)   Determine the shaft diameter for steady loading.
      (ii)   Determine the shaft diameter if the load is suddenly applied with minor shocks.

UNIT-III

5. a) Illustrate the advantages of friction clutches and derive the expression for torque transmitting capacity by a clutch using uniform wear theory. [8M]
   b) A single plate clutch consists of only one pair of contacting surfaces. It is used for an engine, which develops a maximum torque of 120 N-m. Assume a factor of safety of 1.5 to account for slippage at full engine torque. The permissible intensity of pressure is 350 kPa and the coefficient of friction is 0.35. Assuming uniform wear theory, calculate the inner and outer diameters of the friction lining. [7M]

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(OR)

6. a) What is a Disk brake? How is it different from plate clutch? State its advantages. [7M]

   b) A flywheel of mass 100 kg and radius of gyration 350 mm is rotating at 500 rpm. It is brought to rest by means of a brake. The mass of the brake drum assembly is 5 kg. The brake drum is made of cast iron FG260 (c=460 J/kg^{0}C). Assuming that the total heat generated is absorbed by the brake drum only, calculate the temperature rise. [8M]

UNIT-IV

7. a) Elaborate the advantages of gear drives over the chain or belt drives and discuss the factors to be considered for selection of a type of gear. [8M]

   b) A pair of spur gears consist of a 20 teeth pinion meshing with a 120 mm teeth gear. The module is 4 mm. Calculate: (i) the centre distance (ii) the pitch circle diameters of the pinion and the gear (iii) the addendum and dedendum (iv) the tooth thickness (v) the bottom clearance and (vi) the gear ratio. [7M]

(OR)

8. a) What are the fundamental differences between Helical and spur gears? Give the specific applications of both spur and helical gears and show the conventional representation of a helical gear.. [7M]

   b) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 40 teeth gear. The helix angle is 25^0 and the normal pressure angle is 20^0. The normal module is 3 mm. Calculate: (i) transverse module (ii) transverse pressure angle (iii) axial pitch (iv) pitch circle diameters of the pinion and the gear (v) centre distance and (vi) addendum and dedendum circle diameters of the pinion. [8M]

UNIT-V

9. a) What is the difference between hydrostatic and hydrodynamic bearings and explain the factors to be considered while selecting materials for bearings. [7M]

   b) Discuss briefly some of ball bearing and roller bearings with neat simplified sketches. [8M]

(OR)

10. a) Compare ball and roller bearings and list out any four guidelines for selecting a proper bearing. [8M]

    b) In a particular application, the radial load acting on a ball bearing is 5 kN and the expected life for 90% of the bearings is 8000 hr. Calculate the dynamic load carrying capacity of the bearing, when the shaft rotates at 1450 rpm. [7M]

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