14701

B. Tech 6th Semester Examination

Design of Automobile Components-II

AU-6002

Time : 3 Hours   **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one each from section A, B, C and D. Section E is compulsory.

SECTION - A

1. (a) How will you classify the machine design?   (5)

    (b) What are the general considerations in designing a machine component?   (10)

2. A bar of circular cross section is subjected to alternating tensile forces varying from a minimum of 200 kN to a maximum of 500 kN. It is to the manufactured of a material with an ultimate tensile strength of 900 N/mm^2 and endurance limit of 700 N/mm^2. Determine the diameter of bar using safety factor of 3.5 related to ultimate tensile strength and 4 related to endurance limit and is stress concentration factor of 1.65 for fatigue load. Use Good man straight line as basis for design.   (15)

SECTION - B

3. A shaft supported at the ends in ball bearings carries a straight troth spur gear at its mid span and is transmit 7.5 kW at 300 r.p.m. The pitch circle diameter of the gear is 150 mm. The distances between the centre line of bearings and gear are 100mm each. If the shaft is made of steel and allowable shear

stress is 45 N/mm², Determine the diameter of the shaft. Show in a sketch how the gear will be mounted on the shaft, also indicate the ends where bearings will be mounted. The pressure angle of the gear may be taken as 30°. (15)

4. A helical spring is made from a wire of 6mm diameter and has outside diameter of 75mm. If the permissible stress is 350 N/mm² and modulus of rigidity 84 kN/mm², find the axial load which the spring can carry and the deflection proactive turn taking into consideration

   (a) Neglecting the effect of curvature.

   (b) considering the effect of curvature. (8+7=15)

SECTION - C

5. (a) List the basic assumption used in the theory of Hydrodynamic lubrication. (3)

   (b) The load on the journal bearing is 150 kN due to turbine shaft of 300 mm diameter running at 1800 r.p.m. Determine the following:

      (i) Length of the bearing if the allowable bearing pressure is 1.6 N/mm² and

      (ii) Amount of heat to be removed by the lubricant per minute if the bearing temperature is 60°C and viscosity of the oil at 60°C is 0.02 kg/m-s and the bearing clearance is 0.25 mm. The value of K = 0.002. (6+6=12)

6. A pivot bearing supports a shaft of 150 mm diameter which is counterbored at the end with a hole diameter of 50 mm. If the bearing pressure is limited to 0.8 N/mm² and the speed is 100 r.p.m. find (i) the load to be supported. (ii) The power lost in friction and (iii) The heat generated at the bearing. Assume coefficient of friction = 0.015. (5+5+5=15)

SECTION - D

7. A triple threaded worm has teeth of 6mm module and pitch circle diameter of 50mm. If the worm gear has 30 teeth of 14½° and the co-efficient of friction of worm bearing is 0.05, find (i) the load angle of the worm (ii) velocity ratio (iii) centre distance and (iv) efficiency of the worm gearing.

(3+3+3+6=15)

8. (a) How are the gears classified? (7)

   (b) Define circular pitch, diametral pitch, module, and pitch circle diameter of the gear tooth profile. (2×4=8)

SECTION - E

9. (i) What is meant by stress concentration factor?

   (ii) Explain factor of safety.

   (iii) Explain the Solderberg's criterior.

   (iv) Sketch the various types of variable stresses.

   (v) What is the difference between endurance strength and endurance limit of a material?

   (vi) What type of stresses are induced in the shaft?

   (vii) How springs are classified?

   (viii) What is the rigidity consideration in the shaft design?

   (ix) What is the surging phenomenon in springs?

   (x) Why leaf springs are graduated?

   (xi) What is meant by hydrodynamic lubrication?

   (xii) What are the factors to be considered while selecting a material for plain hearing?

(xiii) How gears are lubricated?

(xiv) Write the equation for equivalent radial load for ball bearings.

(xv) What do you understand by mixed lubrication?

(xvi) What are the various forces acting on a level gear?

(xvii) What is a Herring bone helical gear?

(xviii) List the various types of worm gears.

(xix) How the level gears are classified?

(xx) List the various types of the material used for the manufacturing of spur gear.   (2×20=40)