15228

B. Tech 6th Semester Examination

Machine Design-II (OS)

ME-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, select one question from each sections A, B, C, D. Section E (Question 9) is compulsory. Use of PSG Design data is allowed and assume any suitable data if not given.

SECTION - A

1. The bending stress in a machine part fluctuates between a tensile stress of 300MPa and compressive stress of 150MPa. What should be the minimum tensile strength of the material to carry this fluctuation infinitely? Use factor of safety equal to 2.   (20)

2. (a) What is the difference between endurance limit and fatigue strength of a material?

   (b) Discuss different types of fluctuating/variable stresses in detail.

   (c) What precautions should be observed while designing a Forging?

   (d) Discuss various design consideration of casting and machining.   (20)

SECTION - B

3. A hot rolled steel shaft is subjected to a Torsional load that varies from 300 NM clockwise to 120 NM anticlockwise as an applied bending moment at a critical section varies from +410 NM to-230 NM. The shaft is of uniform cross-section and no key way is present at the critical section. Determine the required shaft diameter by taking factor of safety 1.65 for the material, take Ultimate tensile stress=560 MPa, Yield strength=420 MPa, Endurance strength=280 MPa.   (20)

4. A spring is subjected to a load varying from 400N to 1000N. It is to be made of oil tempered, cold wound wire. Design factor based on Wahl's line is 1.25. The spring index is to be 6.0. The free length of the spring should lie between 100 to 150mm. The compression of spring under maximum load is 30mm. Determine the diameter of the wire and the mean coil diameter of the spring. Take yield stress in shear f_{yp}=770N/mm^2 and endurance stress in shear f_e=350N/mm^2. Take C=0.8× 10^{5}N/mm^2.   (20)

SECTION - C

5. (a) What consideration must be observed while mounting a ball or roller bearing? Describe the procedure.   (10)

   (b) A journal bearing is proposed for a centrifugal pump. The diameter of the journal is 0.15m and the load on it is 40kN and its speed is 900rpm. Design the bearing completely.   (10)

6. (a) What is meant by bearing characteristic number? What is its significance? Discuss the variation of coefficient of friction with bearing characteristic number.   (10)

[P.T.O.]

(b) A ball bearing is to be selected to carry a radial load of 9kN and a thrust load of 4.5kN. The average life is to be 5000 hours, with inner ring rotation of 900rpm. What basic load rating must be used in selecting the bearing? If this bearing is to have a life of 5000 hours at a reliability of 98%, what is the basic load rating under these conditions? (10)

SECTION - D

7. A compressor running at 300 rpm is driven by a 15kW 1200rpm motor through a 14½ full depth gear. The centre distance is 0.375m. The motor pinion is to be of C-30 forged steel hardened and tempered and the driven gear is to be of cast steel. Assuming medium shock conditions:

(a) Determine the module, face width and number of teeth on each gear.

(b) Check the gears for wear. (20)

8. (a) Describe the law of gearing. Why involute teeth are preferred over cycloidal teeth? What is the reason of interference in gears and how it can be avoided? (10)

(b) Using a suitable schematic diagram explain the forces acting on worm gears. Also, define normal pitch, helix angle and efficiency of worm gear drive. (10)

SECTION - E

9. (a) What is nipping in a leaf spring?

(b) Write note on stress concentration factor.

(c) List advantages and disadvantages of helical gears.

(d) How is factor of safety evaluated for different types of loading?

(e) Define bearing number and Sommerfield number.

(f) Write Soderberg's equation and state its application to different types of loading.

(g) Explain mechanism of hydrodynamic journal bearing.

(h) Under what circumstances the Bevel gears are used? Give brief classification of bevel gears.

(i) Discuss various terminology used for gears in brief.

(j) Under what circumstances hollow shafts preferred over solid shafts? (10×2=20)