Q5. Attempt any two parts of the following. (10X2=20)

(a) Explain surging and buckling of compression springs. What is Wahl factor? Explain and show the variation of shear stress over the spring wire diameter and modified shear stress variation after employing Wahl factor.

(b) Design a helical spring for a spring loaded safety valve. The valve diameter is 50 mm, maximum allowable stress is 560 N/mm² and spring index is 5. The axial compression when pressure rises from 0.65 N/mm² to 0.7 N/mm² is 3 mm.

(c) Design a semi-elliptical laminated spring 1060 mm between centers of hooks held together at the centre by a 60 mm wide band and carrying a load of 6 kN. Assume permissible stress for the spring material as 490 N/mm², 2 full leaves and 6 graduated leaves. The leaves are unstressed initially and the deflection is not to exceed 70 mm.

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EMT501

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 141501

Roll No.

B Tech

(SEM V) EXAMINATION, 2014-15

DESIGN OF MACHINE ELEMENTS

Time : 3 Hours] *[Total Marks : 100*

Notes: (i) Attempt all questions.

(ii) Assume any missing data suitably.

(iii) Use of design data book is permitted.

Q1. Attempt any *four* parts of the following. (5X4=20)

(a) Write a brief note on Indian Standard designation of low and medium alloy steels.

(b) Explain preferred numbers with suitable examples.

(c) Define factor of safety. What are the important factors that are to considered while selecting factor of safety in design.

(d) Write a brief note on stress concentration due to holes and notches.

(e) Differentiate between design for strength and design for rigidity.

(f) Briefly discuss the design of a machine element under cyclic loading.

Q2. Attempt any two parts of the following.   (10X2=20)

(a) Discuss the classification of bevel gears. With a neat sketch explain the forces acting on a bevel gear and explain the design of a shaft for bevel gears.

(b) A pair of bevel gear is required to transmit 18 kW at 600 rpm. The output shaft is making an angle of 90° with input shaft and rotates at 300 rpm. The pinion has 30, 20° full depth teeth. Safe static stress for material is 105 MPa. Design the gear for beam strength and check for wear strength.

(c) A helical gear has 30 teeth and a pitch diameter 264 mm. Normal module m_n is 6.5 mm and normal pressure angle φ_n is 20°. The force normal to the tooth surface is 6000 N. Find the formative number of teeth and the power transmitted at 600 rpm.

Q3. Attempt any *two* parts of the following.   (10X2=20)

(a) A single start screw is used to raise a load of 50 kN. The nominal diameter is 80 mm and pitch is 10 mm. The square threads are used and the coefficient of friction is 0.15. Neglecting the color friction calculate the torque required to raise the load, to lower the load and the efficiency of the screw. Is the screw self locking?

(b) What are different types of rolling contact bearings? Select a suitable ball bearing to carry a radial load of 8000 N and axial load of 4000 N. The shaft is rotating at 1000 rpm. Average life of 5000 hours is desired. Inner race of the bearing rotates and service factor is 1.5.

(c) A cast iron cylinder head is fastened to a cylinder of bore 480 mm with 8 stud bolts. The maximum pressure inside the cylinder is 1.8 MPa. If stiffness of the part is thrice the stiffness of the bolt what should be the initial tightening load so that the joint is leak proof at maximum pressure.

Q4. Attempt any *one* parts of the following.   (20X1=20)

(a) Discuss various types of stresses induced in a flywheel rim and flywheel arm. A single cylinder double acting steam engine develops 150 kW at a mean speed of 80 rpm. The coefficient of fluctuation energy is 0.1 and the fluctuation of speed is ± 2% of mean speed. If the mean diameter of flywheel is 2 metres and hub and spoke provide 5% of the rotational inertia of the wheel, find the mass of the flywheel.

(b) Describe various forces acting on the connecting rod. Explain about the choice of proper material for design of a connecting rod. For a connecting rod having I cross section show that the rod is four times strong in buckling about Y axis than about X axis.