TE/MECH/SEM VI/CBCS

16 MAY 2019

Duration: 3Hrs

Marks:80

Instructions:

i) Question No.1 is compulsory
ii) Solve any three questions from the remaining
iii) Assume suitable data wherever necessary
iv) Figure to the right indicates marks
v) Use of design data book is permitted

Q.1 **Solve any four questions from following**

a) Write the general procedure for designing any machine component. (05)

b) What is the difference between endurance limit and fatigue strength of a material? (05)

c) "Curved beams cannot be designed by applying the simple bending theory of straight beams" Justify the sentence. (05)

d) Compare the weight, strength and stiffness of a hollow shaft of the same external diameter as that of solid shaft. The inside diameter of the hollow shaft being half the external diameter. Both the shafts have the same material and length. (05)

e) Explain the surface finish factor and size factor with respect to machine element subjected to variable load. (05)

Q.2 a) Design a socket and spigot type of cotter joint to transmit reversible load of 80 KN. Select suitable materials for various parts. (14)

b) Derive the Lame's equation for thick cylinder subjected to an internal pressure only. (06)

Q.3 a) A shaft is supported in bearings A and B 1000 mm apart. An involute gear having PCD of 400 mm is located 300 mm to the right of LH bearing and 600 mm diameter pulley is mounted 350 mm to the left of RH bearing. The gear is driven by a pinion located vertically above, while the pulley transmits power via belt to a pulley located vertically below. The ratio of belt tensions is 2. The pulley weigh 2500 N. Design the shaft, if power transmitted is 30 KW at 400 rpm. The shaft rotates clockwise when viewed from left side. (12)

b) A circular bar of 50 mm is weld to a steel plate by an annular fillet weld and is subjected to a twisting moment of 2 KN-m. If the allowable shear stress in the weld material is 85 MPa. Determine the size of the weld. (08)

Q.4 a) Design a bush type of flexible coupling for connecting a reduction gear shaft to a stone crusher shaft. The unit is driven by 720 rpm motor through 5:1 reduction. Choose the type of coupling and write all the dimensions and design the shaft. (14)

b) Classify different engineering materials in details. (06)

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Q.5 a) A semielliptical leaf spring is used for the suspension of a rear axle of a truck. It consists of two extra full length leaves and ten graduated leaves including master leaf. The centre to centre distance between the spring eyes is 1.2 m. The leaves are made of steel whose σyt is 1500 N/mm^2 and Young's modulus is 207000 N/mm2 and FOS is 2.5. The spring is to be designed for maximum force of 30 KN. The leaves are prestress so as to equalize the stresses in all leaves. Determine cross section of leaves, the deflection at the end of spring and length of the all leaves by considering ineffective length 80 mm. (14)

b) What is service factor? State its significance. (06)

Q.6 a) Design a bottle screw jack for lifting a load of 250 KN and having maximum lift of 270 mm. Select proper material and draw a neat proportional sketch. (14)

b) Explain fatigue test machine with neat sketch? (06)

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