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Total No. of Pages: 02
Total No. of Questions: 09

B. Tech.(ME, IE) (Sem.-5th)
MACHINE DESIGN-I
Subject Code: ME-301
Paper ID: [A0814]

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS TO CANDIDATE:

1. Section –A, is Compulsory.
2. Attempt any four questions from Section-B.
3. Attempt any two questions from Section-C.

Section –A

(10x2=20)

- Q.1.(a) Differentiate between crushing and bending stress.
- (b) What is difference between caulking and fullering?
- (c) Describe the possible ways of failure of rivet joint.
- (d) Explain the difference between rigid and flexible coupling.
- (e) What is endurance limit in design?
- (f) What is stress concentration?
- (g) Indicate the salient parts of flange coupling.
- (h) Mention practical application of muff coupling.
- (i) What is sunk key?
- (j) Define factor of safety.

Section –B

(4x5=20)

Q.2. What is product design? Describe the underlying principles of design in aesthetic and ergonomics.

Q.3. A double riveted double cover butt joint in plates 20mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are:

$$\sigma_t=120\text{MPa}; \tau=100\text{MPa}; \sigma_c=150 \text{ MPa.}$$

Find the efficiency of joint taking the strength of the rivet in double shear as twice than that of single shear.

- Q.4. Where do we use cottor joints? Give practical examples. Write the advantage of cottor joints also.
- Q.5. A foot lever is 1 m from the centre of shaft to the point of application of 800 N load. Find: 1. Diameter of the shaft, 2. Dimensions of the key, assuming width of the arm as 3 times thickness. The allowable tensile stress may be taken as 73 MPa and allowable shear stress as 70 MPa.
- Q.6. Find the diameter of a solid steel shaft to transmit 20 kW at 200 r.p.m. The ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0.5

Section –C

(2x10=20)

- Q.7. Two length of mild steel tie rod having width 200 mm and thickness 12.5 mm are to be connected by means of a butt joint with double cover plates. Design the joint if the permissible stresses are 80 MPa in tension, 65 MPa in shear and 160 MPa in crushing.
- Q.8. Design and draw a cast iron flange coupling for a mild steel shaft transmitting 90kW at 250 r.p.m. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1° in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30 MPa.
- Q.9. Design and draw an oval flanged pipe having 50mm bore .It is subjected to an internal fluid pressure of 7N/mm^2 . The maximum tensile stress in the pipe material is not to exceed 20 MPa and in the bolts 60MPa.

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