IH Used Paper BTECH-II-11-20

Code No: 135AG **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, October - 2020
DESIGN OF MACHINE MEMBERS - I
(Mechanical Engineering)

Time: 2 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

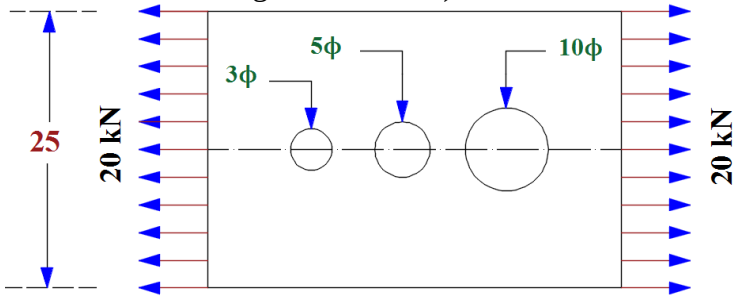
Illustrate your answers with NEAT sketches wherever necessary.

1.a) Explain any two theories of failure.
b) A beam of rectangular cross section is fixed at one end and carries an electric motor weighing 400 N at a distance of 300 mm from the fixed end. The maximum bending stress in the beam 40 MPa. Find the width and depth of the beam, if the depth is that of width. [7+8]

2.a) Explain the concept of stiffness in tension, bending, and torsion.
b) A mild steel shaft of 60 mm diameter is subjected to a bending moment of 3000 N-m and a torque T. If the yield point of steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to the maximum distortion energy theory of failure. [7+8]

3.a) Illustrate the methods of reducing stress concentration.
b) A 50 mm diameter shaft is made from carbon steel having ultimate tensile strength of 600 MPa. It is subjected to a torque which fluctuates between 2000N-m to (– 900) N-m. Using Solderberg method, calculate the factor of safety. [7+8]

4.a) Explain the effect of the following factors on the type of fatigue failure**:** (i) Stress distribution (ii) Surface treatment.
b) A rectangular plate, 15 mm thick, made of a brittle material is shown in figure. Calculate the stresses at each of the three holes of 3 mm, 5 mm, and 10 mm diameter holes. (All dimensions in the figure are in *mm*). [7+8]



5. A double riveted lap joint with chain riveting is made for joining two plates having thickness of 12 mm. If the allowable tensile stress, allowable shear stress, and allowable compressive stress are 65 MPa, 55MPa and 80MPa respectively, find the rivet diameter, pitch of rivets, distance between the rows of rivets, and efficiency of the joint. [15]

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6.a) What is leg of filllet weld and throat of filllet weld? And what is the relationship between the leg and throat of fillet weld?

b) Prove that the plane, where maximum shear stress is induced, is inclined at 45^0 to the leg dimension in the case of parallel fillet weld of equal legs. [7+8]

7. Two rods made of plain carbon steel 40C8 (S_{yt} = 380 N / mm^2) are connected by means of a cotter joint. The diameter of each rod is 50 mm, and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket end, making the following assumptions**:**
a) The yield strength in compression is twice the tensile yield strength, and
b) The yield strength in shear is 50 % of the tensile yield strength.
Take the factor of safety as 6. [7+8]

8. Design a cast iron flange coupling to transmit 15 KW at 900 rpm. The service factor may be assumed as 1.35. The following permissible stresses may be used**:** Shear stress for shaft, bolt and key material = 40 MPa; Crushing stress for bolt and key = 80 MPa; Shear stress for cast iron = 8 MPa. [15]

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