R16

Code No: 135AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, November/December - 2018
DESIGN OF MACHINE MEMBERS - I
(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a)	Enumerate the various phases of design.	[2]
b)	Explain the salient features of the maximum principal stress theory and indicate under what conditions such a theory is useful?	[3]
c)	Describe the causes of stress concentration.	[2]
d)	Explain modified Goodman's line.	[3]
e)	Enumerate the different types of riveted joints.	[2]
f)	How do you obtain a bolt of uniform strength?	[3]
g)	What are the various forces acting on sunk key?	[2]
h)	Write the importance and applications of jib and cotter joints?	[3]
i)	What is the importance of split muff couplings?	[2]
j)	What is a coupling? Classify shaft couplings?	[3]

PART - B

(50 Marks)

2.a) A cast iron pulley transmits 10 KW at 400 rpm. The diameter of the pulley is 1.2 meter and it has four straight arms of elliptical cross section. In which the major axis is twice the minor axis. Determine the dimensions of the arm if the allowable bending stress is 15 MPa.

b) Discuss in detail the factors which govern the selection of material for a machine component. [5+5]

OR

3.a) State and explain various theories of failure under static loading.

b) Find the diameter of shaft required to transmit 60 kW at 150 rpm if the maximum torque is likely to exceed the mean torque by 25% for a maximum permissible torsional shear stress of 60 N/mm^2. Also find the angle of twist for a length of 2.5 meters. Take G = 80 GPa. [5+5]

4. A circular bar of 0.5 m length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar by taking a factor of safety of 1.5, size factor of 0.85, surface finish factor of 0.9. The material properties of bar is given by: Ultimate strength of 650 MPa, Yield strength of 500 MPa and Endurance strength of 350 MPa. [10]

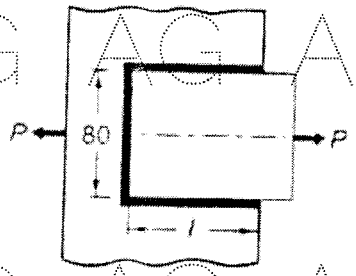
OR

5. A transmission shaft of cold drawn steel 27Mn2 (Sut = 500 N/mm^2 and Syt = 30N/mm^2) is subjected to a fluctuating torque which varies from -100 N-m to +400 N-m. The factor of safety is 2 and the expected reliability is 50%. Neglecting the effect of stress concentration, determine the diameter of the shaft. Assume the distortion energy theory of failure. [10]

6. Design a triple riveted longitudinal double strap butt joint with unequal straps for a boiler. The inside diameter of the drum is 1.3 meters. The joint is to be designed for a steam pressure of 2.4 N/mm^2. The working stresses to be used are σ_t=77N/mm^2, σ=62 N/mm^2; σ_c=120 N/mm^2. Assume the efficiency of the joint as 81 %. [10]

OR

7. A steel plate, 80 mm wide and 10 mm thick, is joined to another steel plate by means of a single transverse and double parallel fillet weld, as shown below Figure. The strength of the welded joint should be equal to the strength of the plate to be joined. The permissible tensile and shear stresses for the weld material and the plates are 100 MPa and 70 MPa respectively. Find the length of each parallel fillet weld. Assume that the tensile force passes through the centre of gravity of three welds. [10]



8. Design a cotter joint to connect two mild steel rods for a pull of 30 kN. The maximum permissible stresses are 55N/mm^2 in tension, 40N/mm^2 in shear and 70 N/mm^2 in crushing. Draw a neat sketch of the joint. [10]

OR

9. It is required to design a knuckle joint to connect circular shafts subjected to an axial force of 50 kN. The rods are coaxial and a small amount of angular movement between their axes is permissible. Design the joint and specify the dimensions of its components. The allowable tensile, compressive and shear stress in the rod and pin material is limited to 80MPa, 100MPa and 40MPa respectively. [10]

10. A propeller shaft is made-up by joining together number of solid shafts. The joint is made by forging the ends of the shaft in the form of a flange, and bolting the flanges together by means of 8 bolts. If the shaft transmits 60kW at 120 rpm, determine the size of the shaft, the diameter and thickness of the flange and the diameter and pitch circle diameter of bolts. Permissible stresses are _ = 35MPa; _c = 45MPa. [10]

OR

11. A mild steel shaft has to transmit 70 kW at 240 rpm. The allowable shear stress in the shaft material is limited to 45MPa. Design a cast iron flange coupling. The shear stress in the coupling bolt is limited to 30MPa. [10]

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