Code No: 135AG **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, May/June - 2019
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.
Illustrate your answers with NEAT sketches wherever necessary.

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PART - A

(25 Marks)

1.a) What is the difference between tolerance and allowance? [2]
b) Explain the terms 'Strain Energy', 'Resilience', and 'Modulus of resilience'. [3]
c) Distinguish between endurance limit and endurance strength. [2]
d) Explain the difference between the Gerber curve and Solderberg and Goodman lines. [3]
e) Distinguish between caulking and fullering. [2]
f) Define the following terms related to screw fastenings**:** Stress area, Major diameter, Minor diameter. [3]
g) Differentiate between a cotter and a key. [2]
h) What are the differences between Sunk key, Woodruff key, and Kennedy key? [3]
i) What is meant by strength basics design of shaft? [2]
j) Mention three practical applications of couplings. [3]

PART - B

(50 Marks)

2.a) List and explain briefly the manufacturing consideration in design.
b) The dimensions of the mating parts, according to basic hole system, are given as**:** Hole**:** 25.00 mm and 25.02 mm; Shaft**:** 24.97 mm 24.95 mm. Find the hole tolerance, shaft tolerance and allowance. [5+5]

OR

3.a) Write a note on Preferred Numbers and their use.
b) A machine part is statically loaded and has an yield point strength of 350 N / mm^2. If the principal stresses are 70 N / mm^2 and 35 N / mm^2, both tensile, find the factor of safety for the following cases**:** (i) Maximum normal stress theory, (ii) Maximum shear stress theory. [5+5]

4.a) What are the factors that affect the endurance limit of a machine part?
b) A shaft of diameter 'd' is subjected to a torque varying between 900 N -m and 1800 N-m. Assuming a factor of safety of 2 and stress concentration factor of 1.2, find the diameter of the shaft. Take σ_u = 650 N / mm^2 and σ_y = 480 N / mm^2, Size factor B = 0.85, and Surface finish factor = C = 0.5. [5+5]

OR

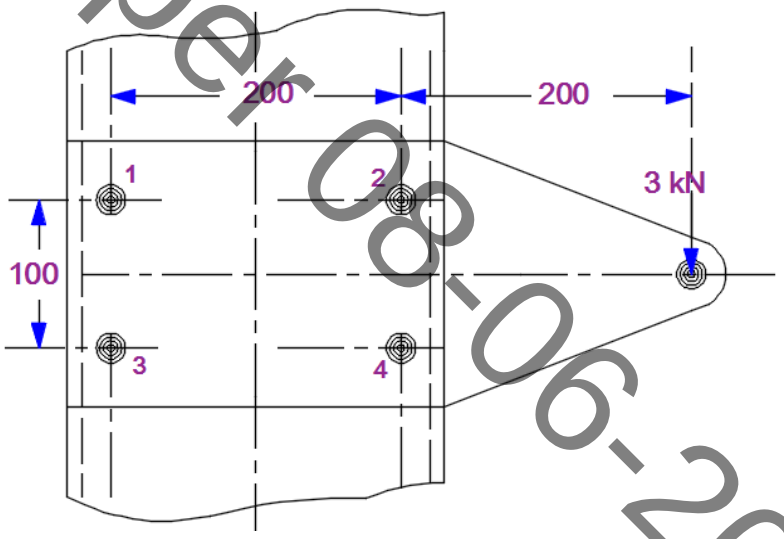
5.a) What is fluctuating stress? Draw a stress – time curve for fluctuating stress.

b) Determine the diameter of a circular rod made of ductile material with fatigue strength of 280 MPa and yield strength of 350 MPa. The member is subjected to a varying axial load from 700 kN to – 300kN. Assume $K_t = 1.8$ and Factor of Safety = 2. [5+5]

6. Prove that the plane, where maximum shear stress is induced, is inclined at 67.5^0 to the leg dimension in the case of transverse fillet weld of equal legs. Also find the expression for maximum shear stress. [10]

OR

7. A steel plate is subjected to a force of 3 kN, and fixed to a vertical channel by means of four identical bolts, as shown in figure. The bolts are made of plain carbon steel 45C8 (S_{yt} = 380 N / mm^2), and the factor of safety is 2. Find the diameter of the shank. (All dimensions in the figure are in *mm*). [10]



8. Draw a neat labeled sketch of Knuckle joint. List its various elements and state their functions. [10]

OR

9.a) Select a key for a 100 mm diameter shaft transmitting 750 kW at 1000 rpm. The allowable shear stress in the key is 100 MPa, and the allowable compressive (crushing) stress is 200 MPa.

b) What is a Cotter? Why taper is provided on cotter? How much taper is provided? [5+5]

10. Design a Clamp coupling for mild steel shaft transmitting 40 kW at 100 rpm. Coefficient of friction between the muff and the shaft surface is 0.3 and number of bolts connecting the two halves are six. The allowable shear stress in the shaft and coupling bolts are 40MPa and 70MPa respectively. [10]

OR

11.a) Describe any two types of shaft couplings, with sketches.

b) A solid shaft is to transmit 1000 kW at 120 rpm. Find the shaft diameter if the permissible shear stress is 80 N / mm^2. If the shaft is made hollow, find the inside and outside diameters when the ratio of inside to outside diameters is 0.5. [5+5]

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