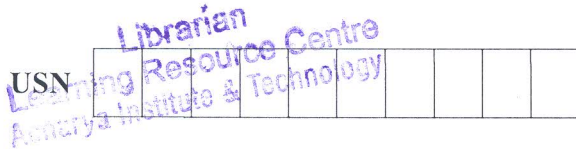


A1015F24

①

10AU52



Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
Design of Machine Elements – I

Time: 3 hrs.

Max. Marks:100

Note:1. Answer any FIVE full questions, selecting atleast TWO questions from each part.
2. Use of data handbook is permitted.

PART – A

- 1 a. Explain the general procedure in machine design. (10 Marks)
 b. A mild steel rod of 12mm diameter was tested for tensile strength with the gauge length of 60mm. Following observations were recorded.
 Final length = 80mm ; Final diameter = 7mm, Yield load = 3.4kN and Ultimate load = 6.1kN. Calculate :
 i) Yield stress
 ii) Ultimate tensile stress
 iii) Percentage reduction in area
 iv) Percentage elongation. (10 Marks)

- 2 a. A cylindrical shaft made of steel of yield strength 700MPa is subjected to a static loads consists of bending moment 10kN-m and a torsional moment of 30kN-m. Determine the diameter of the shaft using Maximum shear stress theory and assuming a factor of safety of 2. Take E = 210GPa and Poisson's ratio = 0.25. (10 Marks)
 b. Define stress concentration and write the methods of reducing stress concentration with simple sketches. (10 Marks)

- 3 a. Determine the thickness of a 120mm wide uniform plate for safe continuous operation if the plate is to be subjected to a tensile load that has a maximum value of 250kN and a minimum value of 100kN. The properties of the plate materials are as follows.
 Endurance limit stress = 225MPa
 Yield point stress = 300Mpa
 Factor of safety = 1.5. (10 Marks)
 b. Write the factors to be considered while designing machine parts to avoid fatigue failure. (10 Marks)

- 4 Design a knuckle joint to transmit 150kN the design stresses may be taken as 75MPa in tension, 60MPa in shear and 150MPa in compression. (20 Marks)

PART – B

- 5 a. A solid circular shaft is subjected to a bending moment of 3000N-m and a torque of 10000 N-m. The shaft is made of 45C8 steel having ultimate tensile stress of 700MPa and a ultimate shear stress of 500MPa. Assuming a factor of safety as 6. Determine the diameter of the shaft. (10 Marks)
 b. What are the required properties of materials for shafts? (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 6 a. Fig Q6(a) shown a bolted assembly of two components. The initial preload on the bolt is 4kN and the external force acting on the bolt is 7.5kN. The ratio of the stiffness of the member to the stiffness of the bolt is 2.5. The bolt with coarse thread is made of plain Carbon steel and its yield strength is 375 N/mm^2 . Taking factor of safety = 3, Design the size of bolt.

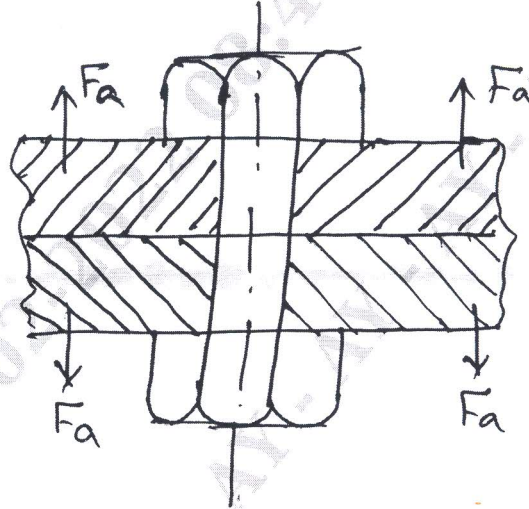


Fig Q6(a)

(10 Marks)

- b. Define the following :

i) Pitch ii) Lead iii) Crest iv) Root v) Helix angle.

(10 Marks)

- 7 A double riveted lap joint is to be made between 9mm plates. If the safe working stresses in tension, crushing and shear are 80 N/mm^2 , 120 N/mm^2 and 60 N/mm^2 respectively. Design the riveted joint. (20 Marks)

- 8 a. Two plates are joined by means of fillet welds as shown in Fig Q8(a). The leg dimension of the weld is 10mm and the permissible shear stress at the throat cross section is 75 N/mm^2 . Determine the length of each weld.

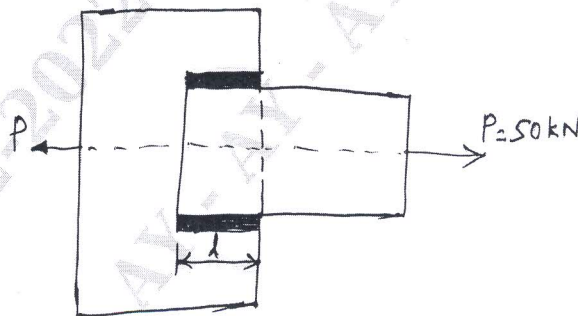


Fig Q8(a)

(10 Marks)

- b. Explain different forms of thread profiles used in power screws. (10 Marks)
