

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019****Subject Code: 2162001****Date: 12/12/2019****Subject Name: Design of Mechanisms - I****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

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|-----------|-----|--|----|
| Q.1 | (a) | Differentiate between crushing stress & bearing stress. | 03 |
| | (b) | Explain maximum principle stress theory | 04 |
| | (c) | Write short note on Factor of safety & preferred number | 07 |
| Q.2 | (a) | Why cotter is provided with taper ?write advantage of cotter joints | 03 |
| | (b) | What is lever ?Explain principle on which it works | 04 |
| | (c) | Design a knuckle joint to transmit 50 kN. The design stresses may be taken as 80 MPa in tension, 40 MPa in shear and 80 MPa in compression. | 07 |
| OR | | | |
| | (c) | Design a Bell crank lever having load arm 500mm and effort arm of 150mm respectively. The maximum load to be raise is 4500N. Use the following allowable stresses for the pin and lever material. Tensile Stress = 75 N/mm ² Shear Stress= 60 N/mm ² & Bearing pressure = 10 N/mm ² | 07 |
| Q.3 | (a) | What is limitation of Euler's formula | 03 |
| | (b) | State and explain the Rankine formula in the design of column | 04 |
| | (c) | An offset link with an effort of 10 mm is shown in fig.-1 The thickness 't' of the link is 26 mm if the permissible tensile stress for the link is 100 N/mm ² ,determine the load carrying capacity of the link. | 07 |
| OR | | | |
| Q.3 | (a) | What is slenderness ratio | 03 |
| | (b) | Why the efficiency of square thread is less than 50%. | 04 |
| | (c) | Explain Johnson's formula for designing Column | 07 |
| Q.4 | (a) | Write down the condition for the self locking of screw. | 03 |
| | (b) | What is wahl's factor? Why it is considered? | 04 |
| | (c) | Compare the weight, strength and rigidity of a hollow shaft of same external diameter as that of solid shaft, Both the shaft are made of same material. Assume that the diameter ratio for the hollow shaft as 0.6. | 07 |
| OR | | | |
| Q.4 | (a) | Write down the condition for overhauling of screw | 03 |
| | (b) | Explain spring in series and spring in parallel derive formula with figure. | 04 |

- (c) As per figure 2. A bracket is bolted to column by 6 bolts arranged in two columns. The distance between bolts along the row is 75mm and along the column 50mm. The joint is subjected to maximum eccentric force of 50kN acting at 150mm away from the centre of column. Taking allowable stress in the bolt as 150N/mm², Determine the size of each bolt. 07
- Q.5** (a) What are end fixity coefficient? 03
 (b) Explain hoop stress and Longitudinal Stress. 04
 (c) Design closed coil helical spring (neglecting the effect of stress concentration) from following data 07
 Maximum load = 2750N
 Minimum load = 2250N
 Axial deflection = 6 mm
 Spring index = 5
 Permissible shear stress = 420 MPa
 Modulus of rigidity = 84 kN/mm²

OR

- Q.5** (a) What is meant by dynamic load & static load? 03
 (b) Write the terminology of semielliptical leaf spring With neat sketch. 04
 (c) Two helical springs are connected in series. One of the springs is made of 6 mm dia. wire with spring index of 5 and 12 coils. Other is made of 7 mm dia. wire with spring index 6 and 18 coils. Calculate the spring rate for two springs. Determine the maximum axial load that can be supported by the combination of springs. The allowable shear stress is 450 MPa and modulus of rigidity is 80 GPa 07

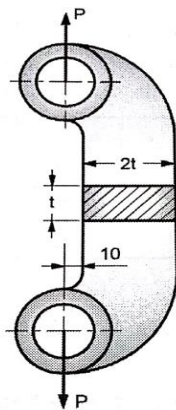


Fig:1

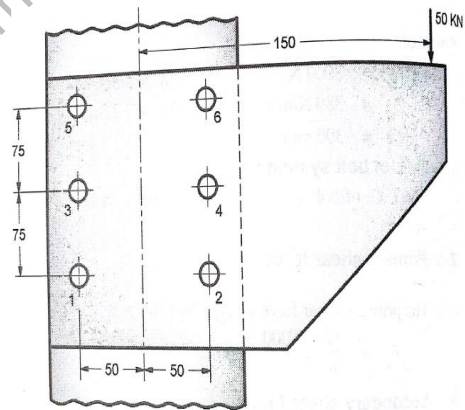


Fig:2
