[Total No. of Printed Pages:2] **CODE NO:- U-210**

FACULTY OF ENGINEERING AND TECHNOLOGY

TE(Mech/Prod)Examination - DEC - 2014

DESIGN OF MACHINE ELEMENTS-I(Revised)

[Time: THREE *Hours*] **[Max. Marks: 80]**

"Please check whether you have got the right question paper."

I) Attempt any three questions from each section.
II) Use of design data book, non-programmable calculator is allowed, if necessary.
III) Assume additional suitable data, if necessary.
IV) Draw neat sketches wherever necessary.

SECTION A

Q 1 a) What do you understand by 'selection of materials' in machine design? (03)

b) Define the following (03)

i) Crushing stress ii) Bearing pressure iii) Bending stress

C Derive the equation of torque requirement for lifting the load by power screw. (06)

Q2 A cylindrical shaft made of steel (yield strength=700MPa) is subjected to static loads consisting of bending moment of 11 kN-m and a twisting moment of 30kN-m. Determine the diameter of the shaft using maximum shear stress theory of failure and Maximum distortion energy theory of failure. Assume factor of safety of2. (12)

Q3 A 50 mm cast iron rod is subjected to an axial tensile load of 50 kN plus torsional moment of 330 Nm. Determine maximum shear stress, maximum and minimum normal stresses. Refer figure. (12)

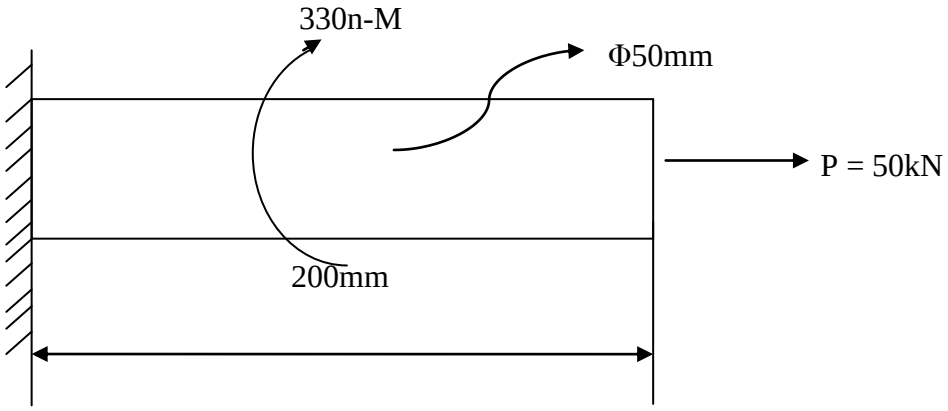

Figure1

Q4 Design a socket and spigot cotter joint for carrying 50 kN tensile load. Select appropriate materials for various components of the joint. (12)

Q5 Write short note on any four of the following. (16)

i) Types of keys
ii) Preloading in bolted joints
iii) Self locking screw
iv) Flexible couplings
v) Re-circulating ball screw

SECTION B

Q6 A 25mm diameter machined steel cantilever 250 mm long is loaded on the end with a force that varies from 265 N to 450 N up. There is a 6 mm fillet where the member is connected to the support which causes a theoretical stress concentration factor K_t=1.32. The notch sensitivity factor q may be taken as 0.92. The material has an ultimate stress=550 MPa, an endurance limit in reversed bending is 240 MPa, and yield stress is 415 MPa. Determine: maximum bending stress, minimum bending stress, mean stress, variable stress and the factor of safety. (12)

Q7 A pair of steel plates are joined by welded connection; subjected to an eccentric force of 50 kN. Determine the size of the weld if the permissible shear stress should not exceed 70 MPa. Refer figure2 (12)

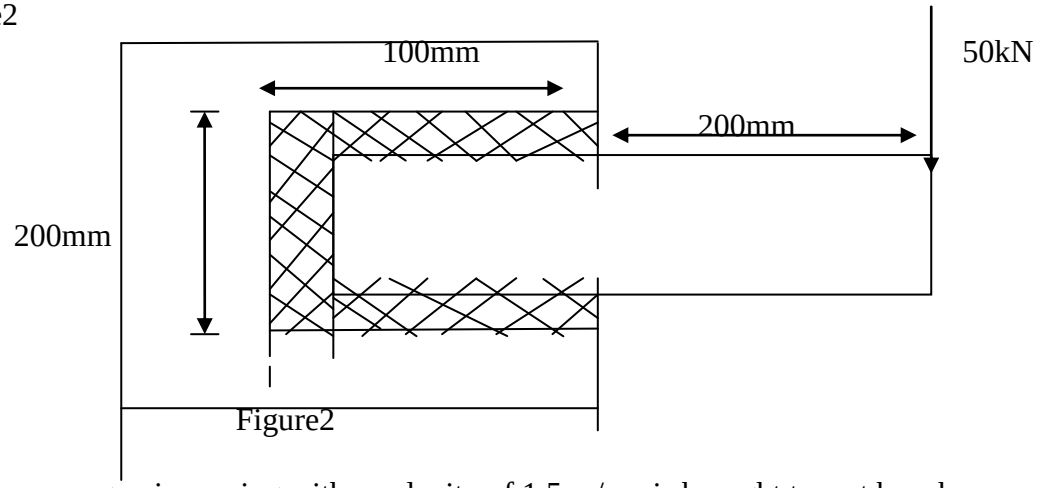

Figure2

Q 8 A railway wagon is moving with a velocity of 1.5 m/sec is brought to rest by a bumper consisting of two helical springs arranged in parallel. The springs are compressed by 150 mm, in bringing the wagon to rest. The mass of wagon is 10000kg. The spring index is 6. The spring are made of oil hardened tempered steel wire with ultimate tensile strength 1500 MPa; the modulus of rigidity is 81370 MPa, the permissible shear stress can be taken as 50% of ultimate tensile strength. Design the spring and calculate (12)

i) maximum force on each spring
ii) wire diameter
iii) mean coil diameter
iv) number of active coils

Q9 a) Derive the expression of eccentrically loaded riveted joints. (06)

b) Define the following terms: a) Spring index b) Free length c) Pitch of coil d) Gradient of spring e) Solid length (06)

Q10 Write short note on any four (16)

i) buckling of spring
ii) Wahl's correction factor
iii) types of riveted joint
iv) notch sensitivity
v) failure of riveted joints