[Total No. of Printed Pages:2] **CODE NO:- Z-219**

FACULTY OF ENGINEERING & TECHNOLOGY

T.E(Mech/Prod) Year Examination - June – 2015

Design of Machine Elements - I

(Revised)

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

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

i) Answer any three questions from each section
ii) Use separate answer – book for each section
iii) Figures to the right indicate full marks
iv) Assume suitable data, if necessary and state them clearly

SECTION A

Q.1 a) Explain in detail the basic procedure of machine design 04

b) Define the following: i) Brittleness ii) Ductility iii) Stiffness iv) Hardness 04

c) State the meaning of the following designation: i) 26Cr4Mo2 ii)FeE400 iii)55C4 iv) WM 400 04

Q.2 A machine member 50mm diameter by 250mm long is supported at one end as cantilever beam which is subjected to a tensile force of 25kN and bending force of 4kN and torque of 1kNm. Calculate the maximum, minimum normal stress using maximum shear stress theory 12

Q.3 Design a socket and spigot joint used to connected two coaxial shafts subjected to a tensile force of 25kN. The material to be selected for the joint is 30C8 (S_{yt} = 400 MPa) Draw a neat sketch and specify major dimensions 12

Q.4 A braket is subjected to a steel column by means of four identical bolts two at A and B. The maximum load that comes on the braket is 6kN acting vertically downword distance of 250mm from the face of the column. The bolts are made of steel 40C8(Sty=380MPa) and the factor of safety 5. Determine the major diameter of the bolts on the basis of maximum principal stress Assume (d_c = 0.8d) 12

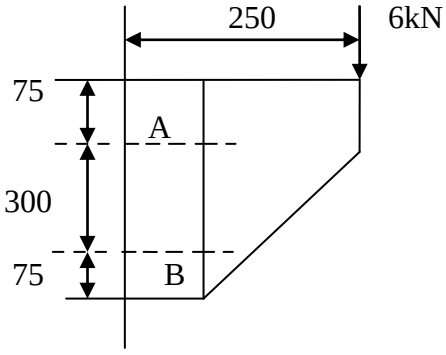

Figure. 1

Q.5 Write short notes (any four) 16

a) Torque requirement for lifting load by power screw
b) Engonomic consideration in design
c) Muff coupling
d) Knuckle joint design procedure
e) Aesthetic consideration in design

SECTION B

Q.6 A welded connection is used to join two steel plates as shown in the figure 2 is subjected to an eccentric force of 12kN. Determine the throat dimensions of the welds the permissible shear stress is limited to 95 MPa. Assume static conditions 12

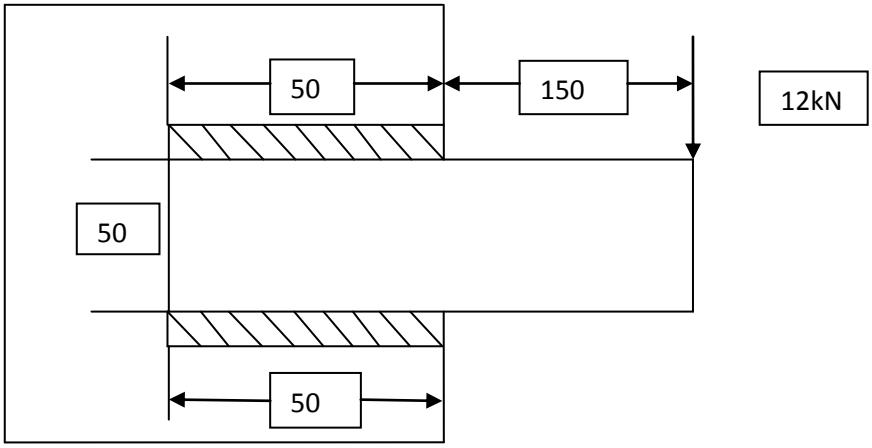

Figure. 2

Q.7 a) Explain stress concentration and remedies to reduce stress concentration 04

b) A circular machine member of ductile material is varying axial load that varies from 250000N (compressive) to 750000N (tensile). The endurance limit = 250 MN/m^2, tensile yield stress = 350MN/m^2. Assume stress concentration factor of 1.8 and factor of safety = 2. Calculate the diameter of the member 08

Q.8 a) Derive the expression for stress and deflection for helical compression spring 06

b) It is required to design a helical compression spring subjected to a force of 600?N. the deflection of the spring corresponding to the force is approximately 20mm. the spring index should be 5. The spring is made up of cold drawn steel wire with ultimate tensile strenth of 1000MPa. The permissible shear stress of the spring is assumed to be 50% of ultimate tensile strength, (G = 81370 MPa) design the spring and calculate a) write diameter b) mean coil diameter c) number of active coils d) total number of coils e) free length of the spring f) pitch of the coil 06

Q.9 A semi elliptical leaf spring consists of two extra full length leaves and eight graduate leaves including master leaf. The center to center distance between the two eyes is in. the leaves are made up of alloy steel with Syt = 1500 MPa and E = 2070000MPa and factor of safety is 2. The maximum spring load is 32kN. The leaves are pre- stressed so as to equalize stresses in all leaves under maximum load.determine the dimensions of the cross section of the leaves and the deflection at the end of the leaves 12

Q.10 Write short notes on (<u>any four</u>) 16

a) Causes of stress concentration
b) Caulking and fullering
c) Shot peening
d) Nipping in multi leaf spring
e) Cumulative fatigue damage