Total No. of Printed Pages:2

SUBJECT CODE NO:- P-129
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(MECH/PROD) Examination May/June 2017
Design of Machine Elements-I
(Revised)

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

N.B
1. Solve any three questions from each section
2. Use separate answer-book for each section
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary and state them clearly.

Section A

Q.1 a) Define the following 04
i) Torsional shear stress
ii) Leverage
iii) Factor of safety
iv) Stiffness

b) Explain basic procedure of machine design. 04

c) Explain aesthetic considerations of design. 04

Q.2 Explain in detail the design procedure of a socket and spigot joint. 12

Q.3 a) Derive the expression for eccentric load parallel to axis bolt. 06

b) A C frame is subjected to a force of 15 KN as shown in figure1. It is made of grey cast iron FG 300 and factor of safety is 2.5. Determine the dimensions of the cross section of the frame. 06

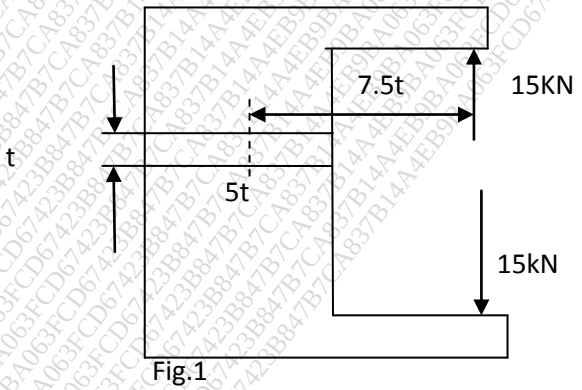

Fig.1

Q.4 Derive the design procedure of a protective rigid flange coupling. 12

Q.5 Write short notes on the following (any four) 16
a. Ergonomic consideration in design.
b. Design procedure of knuckle joint.

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c. Selection and use of theories of failures.
d. Bolt of uniform strength.
e. Recirculating ball screw.

Section B

Q.6 A steel rod is subjected to a reversal axial load is 200KN. Find the diameter of the rod for a factor of safety2. Neglect column action. The material has an ultimate tensile stress of 1070 MPa and yield stress 910 MPa. The endurance stress in reverse bending is 50% of ultimate stress. The axial loading factor = 0.7, surface factor = 0.8; stress concentration factor = 1. 12

Q.7 a) Explain low cycle and high cycle fatigue. 4

b) A 40 mm diameter shaft is made of carbon steel having ultimate tensile stress of 630 MPa and yield stress in shear is 255 MPa. It is subjected to torque which fluctuates from 2100Nm to-810Nm. Using Soderberg method, calculate the factor of safety. The endurance stress in shear is 173.5MPa and yield stress in shear is 255MPa. 8

Q.8 A helical compression spring is required to deflect through approximately 25mm when the external force varies from 550 N to 1050 N. The spring index is 6. The spring has square and ground ends. There should be a gap of 1 mm between the adjacent coils when subjected to maximum force 1050N. The spring is made of cold drawn steel wire with ultimate tensile strength of 1000 Mpa and permissible shear stress of 50% of ultimate tensile stress and (G= 81370 Mpa). Design the spring and calculate wire diameter, mean coil diameter, number of active coils, solid length, free length, required spring rate. 12

Q.9 a) Derive the expression for eccentric load perpendicular to axis of riveted joint. 4

b) A bracket is attached to a vertical column by means of 4 identical rivets which is subjected to an eccentric load of 28KN as shown in figure 2. Determine the diameter of rivets, if the permissible shear stress is 60 MPa. 8

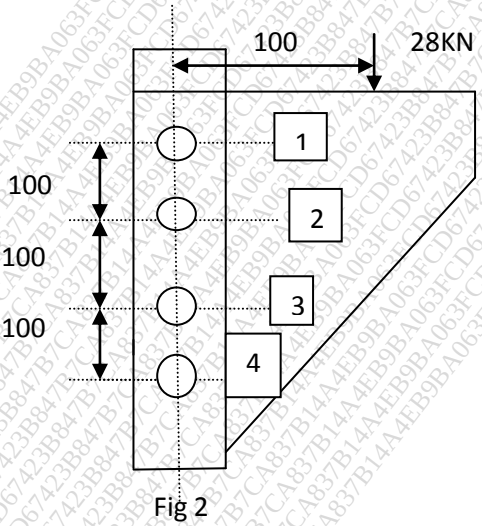

Fig 2

Q.10 Write short notes (any four) 16

a) Stress concentration causes and remedies
b) Surge in springs
c) Advantages of welded joint over riveted joint
d) Comulative fatigue damage
e) Short Peening

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