H.T.No. | | | | | | | | | | |

Code No: ME1522 **GEC-R14**

III B. Tech I Semester Regular Examinations, November 2016

PRINCIPLES OF MACHINE DESIGN

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B.** All Questions carry equal Marks.

PART-A

6 × 2 = 12M

1. Define factor safety? How it changes for ductile and brittle materials.
2. a) What is principal plane?
   b) Which theory of failure is used for ductile materials?
3. a) Write Goodman's equation for design of a component
   b) What is the surface finish factor for a mirror polished specimen?
4. a) What permissible stresses are used in design of welded joints?
   b) Why butt joint preferable over a lap joint?
5. In a cotter joint, the width of the cotter at centre is 50 mm and its thickness is 12 mm. The load acting on the cotter is 60kN. Find the shear stress developed in the cotter?
6. Draw neat sketch of muff coupling and indicate the important dimensions

PART-B

4 × 12 = 48M

1. A hollow shaft is required to transmit 600 kW at 110 r.p.m., the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MPa and twist in a length of 3 metres not to exceed 1.4 degrees. Find the external diameter of the shaft, if the internal diameter to the external diameter is 3/8. Take modulus of rigidity as 84 GPa. (12M)

2. The magnitude of normal stress on two mutually perpendicular planes, at a point in an elastic body is 60 MPa (compressive) and 80 MPa (tensile) respectively. Find the magnitudes of shearing stresses on these planes if the magnitude of one of the principal stresses is 100 MPa (tensile). Find also the magnitude of the other principal stress at this point. (12M)

3. a) What are the methods of reducing stress concentration? (4M)

b) A round shaft made of brittle material and subjected to a bending moment of 15 N-m is shown in below figure1. The stress concentration factor at the fillet is 1.5 and the ultimate tensile strength of the shaft material is 200 N/mm^2. Determine the diameter d, the magnitude of stress at the fillet and the factor of safety. (8M)

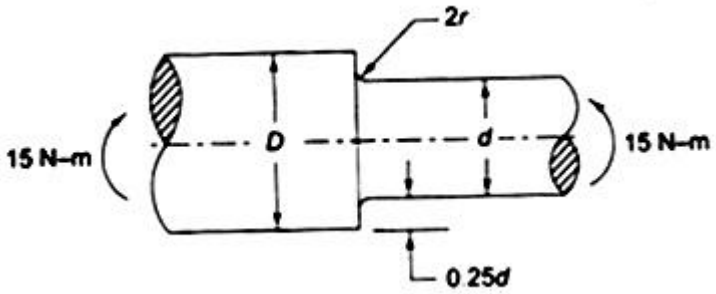

Figure 1

4. The bracket as shown in Figure 2 is to carry a load of 45 kN. Determine the size of the rivet if the shear stress is not to exceed 40 MPa. (12M)

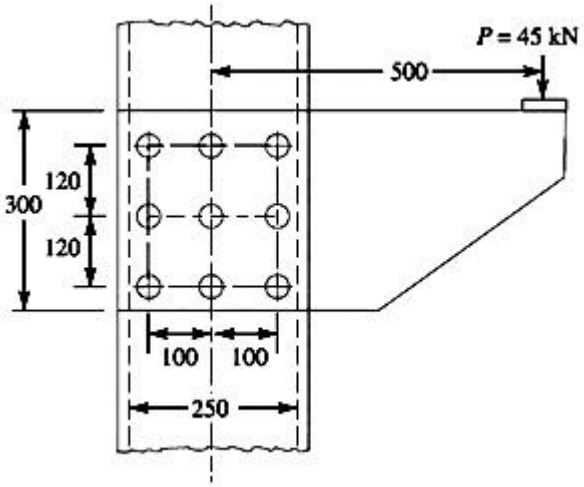

Figure 2

5. a) Describe the design procedure of a gib and cotter joint. (4M)

   b) Design a knuckle joint to connect two mild steel bars under a tensile load of 25 kN. The allowable stresses are 65 Mpa in tension, 50 Mpa in shear and 83 Mpa in crushing. (8M)

6. Design a cast iron protective type flange coupling to transmit 25 KW at 1000 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.5. The following permissible stresses may be used Shear stress for shaft, bolt and key material = 45 MPa, Crushing stress for bolt and key = 90 MPa, Shear stress of cast iron = 12 MPa. Draw a neat sketch of the coupling. (12M)

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