BTS –VI –04.15–0150 Reg. No. | | | | | | | | |

A

B. Tech. Degree VI Semester Examination April 2015

ME 603 MACHINE DESIGN I

(*2006 Scheme*)

Time: 3 Hours Maximum Marks: 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) What do you mean by factor of safety? What are the important factors that influence the magnitude of factor of safety?

(b) What is meant by stress concentration?

(c) Discuss the factors to be considered while selecting a thread profile.

(d) How are keys classified?

(e) Explain the procedure for making a riveted joint.

(f) Explain the phenomenon of surge in springs. How can it be eliminated?

(g) Show that the shear stress developed in circular fillet weld subjected to torsion is given by $\tau = \frac{2.83T}{\pi bd^2}$ where T - Torque acting on rod, b - size of weld, d - diameter of cylindrical rod welded to a vertical flat surface.

(h) Compare the weight and strength of a hollow shaft of same external diameter as that of solid shaft. The inside diameter of hollow shaft being half the external diameter. Both the shaft have same material and length.

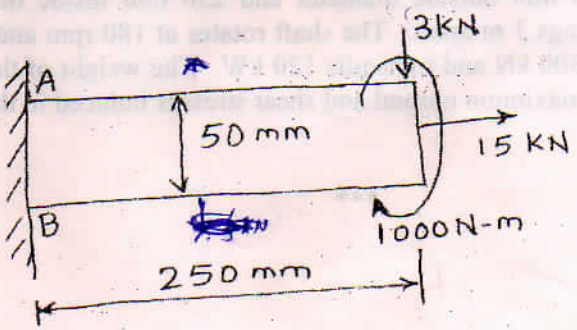
PART B

(4 x 15 = 60)

II. Determine the diameters of a hollow shaft to sustain a twisting moment that fluctuates between 2.5 kN-m and 1.5 kN-m together with a bending moment that fluctuates between +2 kN-m to –2 kN-m. Assume the inner diameter to be 0.6 times the outer diameter. Take yield stress as 400 MPa, endurance stress as 270 MPa, factor of safety as 2, size factor as 0.85, surface finish factor as 0.85, correction factor for reversed torsional loading as 0.55.

OR

III. A circular shaft as shown in figure is subjected to a bending load of 3 kN, torque of 1000 Nm and an axial pull of 15 kN. Find stresses at A & B.



(P.T.O.)

IV. Design a socket and spigot cotter joint to sustain an axial load of 100 kN. The material selected for joint has following properties. Allowable tensile stress = 120 MPa, shear stress = 80 MPa, crushing stress = 160 MPa. Draw a neat sketch of the joint.

OR

V. Design a rigid flange coupling to transmit 20 kW at 900 rpm. The allowable shear stress for flange = 8 MPa, shear stress for shaft, bolt and key material = 40 MPa, crushing stress for bolt and key = 80 MPa. Draw a neat sketch of the coupling.

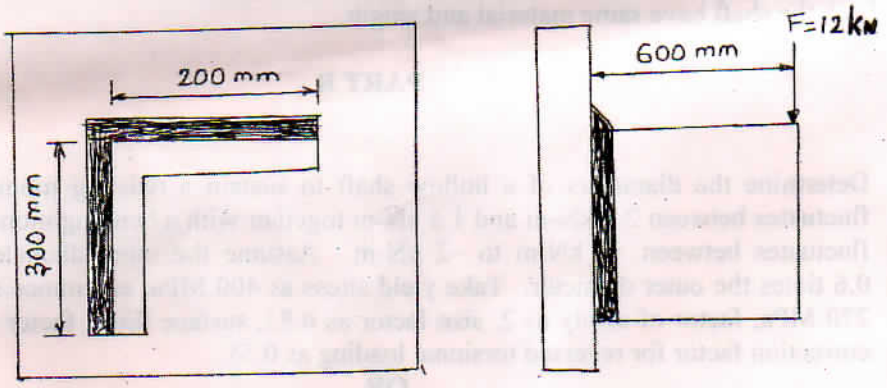
VI. Design a longitudinal and circumferential riveted joint for a boiler of internal diameter 2 m, subjected to an internal pressure of 1 MPa. The longitudinal joint is a triple riveted butt joint with equal cover and efficiency of 85%. The pitch of outer row is twice the pitch of inner rows. The circumferential joint is double riveted lap joint. The allowable stress for plate and rivet material are 120 MPa in tension, 70 MPa in shear and 180 MPa in crushing.

OR

VII. Design a valve spring of a petrol engine for the following operating conditions:

Spring load when the valve is open	=	400 N
Spring load when the valve is closed	=	250 N
Maximum inside diameter of the spring	=	25 mm
Length of the spring when the valve is open	=	40 mm
Length of the spring when the valve is closed	=	50 mm
Maximum permissible shear stress	=	400 MPa

VIII. Determine the size of weld for a bracket loaded as shown in the figure. The permissible shear stress for the weld material is 75 MPa.



OR

IX. A hollow shaft of 400 mm outside diameter and 250 mm inside diameter is supported on two bearings 3 m apart. The shaft rotates at 180 rpm and receives an axial thrust load of 300 kN and transmits 120 kW. The weight of the shaft is 90 kN. Determine the maximum normal and shear stresses induced in the shaft.

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