BTS-VI-04.14-0178

B

B.Tech. Degree VI Semester Examination April 2014

ME 603 MACHINE DESIGN I

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)
(Use of approved design data book permitted.
Missing data, if any may be suitably assuemed)

(8 x 5 = 40)

I. (a) Briefly explain stress concentration reduction methods.

(b) Derive the relation Ssy = 0.577 Syt in distortion energy theory of failure.

(c) Explain the condition of self-locking of power screw.

(d) Briefly explain a cotter. List three types of cotter joints.

(e) What is a Lozenge joint?

(f) List the four verities of spring materials used in the majority of applications.

(g) Briefly explain critical speed of shaft.

(h) What are the conditions to get the strength of the weld deposit is more than the strength of the connected parts?

PART B

(4 x 15 = 60)

II. A cylindrical shaft made of steel of yield strength 7000kgf/cm^2 is subjected to static loads consisting of a bending moment 1000kgf-m and a torsional moment 3000kgf-m. Determine the diameter of the shaft using (i) Maximum shear stress theory (ii) Maximum strain energy theory of failure. Take E = 2.1 x 10^6 kgf/cm^2, Poisson's ratio = 0.25 and factor of safety = 2.

OR

III. A circular bar of 500mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 2000 kgf and a maximum value of 5000 kgf. Determine the diameter of bar by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9. Other material properties may be taken as
Ultimate strength = 65 kgf/mm^2
Yield strength = 50 kgf/mm^2
Endurance strength = 35kgf/mm^2

(P.T.O.)

IV. A double threaded power screw, with ISO metric trapezoidal threads, is used to raise a load of 300kN. The nominal diameter is 100mm and the pitch is 12mm. The coefficient of friction at screw threads is 0.15. Neglecting collar friction, calculate

(i) Torque required to raise the load

(ii) Torque required to lower the load and

(iii) Efficiency of the screw.

OR

V. Design a gib and cotter joint to carry a maximum load of 35KN. Assuming that the gib, cotter and rod are of same material and have the following allowable stresses. ft=20N/mm^2, fs=15N/mm^2, fc=50N/mm^2.

VI. Two plates of 10mm thickness each are to be joined by means of a single riveted double strap butt joint. Determine the rivet diameter, rivet pitch, strap thickness and efficiency of the joint. Working stresses in tension and shearing are 8kgf/mm^2 and 6kgf/mm^2 respectively.

OR

VII. Design a helical compression spring for a maximum load of 1000N for a deflection of 25mm using the value of spring index as 5. The maximum permissible shear stress for spring wire is 420 N/mm^2 and G = 84x10^3 N/mm^2.

VIII. A plate 100mm wide and 12.5mm thick is to be welded to another plate by means of parallel fillet welds. The plates are subjected to a load of 50KN. Find the length of the weld so that the maximum stress does not exceed 56 N/mm2. Consider the joint first under static loading and then under fatigue loading.

OR

IX. A solid circular shaft is subjected to a bending moment of 30,000 kgf-cm and a torque of 100000 kgf-cm. The shaft is made of C-45 steel having ultimate ensile stress of 7000 kgf/cm^2 and a ultimate shear stress of 5000 kgf/cm^2. Assuming a factor of safety as 6, determine the diameter of the shaft.

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