



Printed Pages : 3

TME-502

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4075

Roll No.

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B. Tech.

**(SEM. V) EXAMINATION, 2008-09
MACHINE DESIGN - I**

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions. Design Data Books are allowed in Exam hall. Any missing data may be assumed suitably for numerical part.

- 1 Attempt any **two** parts of the following : $10 \times 2 = 20$
- (a) Explain the various considerations in the choice of materials for design. 10
- (b) Enumerate different materials for the components subjected to creep. 10
- (c) Describe briefly how the design of a new machine should be done systematically. 10
- 2 Attempt any **two** parts of the following : $10 \times 2 = 20$
- (a) What are the various conditions that reduce fatigue strength of materials? What factors should be considered while designing against fatigue?
- (b) Explain various theories of failure.
- (c) Discuss Endurance limit. What is the difference between endurance limit and fatigue strength of a material ?

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- 3 Attempt any **two** parts of the following: **10×2=20**
- (a) Two 35 mm dia shafts are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shaft transmit a torque of 800 N-m at 350 rpm for the safe stresses mentioned below, calculate (i) diameter of bolts (ii) thickness of flanges (iii) key dimensions (iv) hub length and (v) power transmitted Given safe shear stress for shaft material = 63 MPa. Safe stress for bolt material = 56 MPa Safe stress for cast iron coupling = 10 MPa Safe stress for key material = 46 MPa
- (b) Design the longitudinal welded joint for a 1.25 m diameter steam boiler carrying steam pressure of 5 N/mm². The allowable stress of the plate material is 80 N/mm² in tension. Length of the shell of boiler is 5 meter. Take allowable stress for shielded arc weld = 95 N/mm².
- (c) Write short note on the splined shaft, covering the points of application and different types of splined shaft.

- 4 Attempt any **two** parts of the following: **10×2=20**
- (a) Design a simple screw jack to lift a load of 100 kN having a maximum lift of 260 mm. Allowable bearing pressure between screw and nut is 15 N/mm². The stresses for screw and nut are given as follows:

Parts	Ultimate Tensile/ Compression strength N/mm ²	Shear stress	F.S.
Screw	800	340	4
Nut	552	260	5

Coefficient of friction between screw and nut = 0.15



- (b) What is function of spring? How do you differentiate between close coiled and open coiled spring? What are the various types of helical spring ends? What is Wahl correction factor and why is it needed?
- (c) Give a detailed design procedure for design of leaf springs, under fatigue loading. What materials for leaf springs are used ?

5 Attempt any **four** parts out of following : **5×4=20**

- (a) How you define design? What is use of design?
- (b) Describe brain storming. What are its rule?
- (c) What do you mean by 'need analysis'? Write its importance in design.
- (d) What do you mean by 'Design by Evaluations'? Give some examples
- (e) Carry out a brain storming session for the following problems.
- (i) Low cost housing for the urban middle class.
- (ii) Hand drying in a hostel having 200 students.
- (f) Give the appropriate need statement and carryout the need analysis giving important specifications.
- (i) A city water supply
- (ii) A cheap family vehicle.
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