Code No. : **6301**

FACULTY OF ENGINEERING
B.E. 3/4 (Mech./Prod.) I Semester (Supplementary) Examination, July 2010
DESIGN OF MACHINE ELEMENTS

Time : 3 Hours]   [Max. Marks : 75

Note : i) Answer **all** questions from Part A. Answer **five**
           question from Part **B**.
       ii) Provide **neat** proportionate freehand sketches for **all**
           the designs.

PART – A   25

1. Write the percentage composition of the following steels.

   a) 55 C8   b) 17 mn 1 cr 95   2

2. Why there is a necessity of preferred numbers in design ? Briefly explain about
   them.   3

3. Draw S-N diagram for the ductice material from that define endurance limit.   3

4. Briefly explain Miner's rule.   2

5. What is the difference between shaft and axle ?   2

6. What is the purpose of a coupling ? Give its classification.   2

7. Why gibs are used in a cotter joint ?   2

8. What are the various types of locking devices ? Discuss their relative merits and
   demerits ?   3

9. What do you understand by the term efficiency of a riveted joint ?   3

10. Through a sketch, explain what is meant by

   a) leg length   b) throat thickness of a weld section.   3

(This paper contains 3 pages)   1   P.T.O.

PART – B   **50**

11. A critical section in a shaft is subjected to bending and twisting simultaneously. The Bending moment causes a maximum bending stress of 55 mpa and twisting moment causes a shear stress of 31.5 Mpa. Determine the factor of safety according to

    a) Maximum principal stress theory   b) Maximum shear stress theory
    c) Distortion energy theory if tensile test gives a yield limit of 284 Mpa.

12. A shaft is subjected to bending moment that varies from + 400 N.m to –200 N.m and a twisting moment at the critical section varies from 300 N.m clock wise to 100 N.M counter clock wise. Determine the shaft diameter for the following data. Factor of safety = 2, ultimate stress = 560 mpa, yield stress = 320 mpa. Endurace stress = 280 mpa, size correction factor = 0.85, surface correction factor = 0.85, fatigue stress concentration factor = 1.4.

13. Design a CI, protective type flange coupling to transmit 15 KW at 900 rpm. The following permissible stresses may be used.
    Shearing stress for shaft, bolt and key = 40 mpa.
    Crushing stress for bolt and key = 80 mpa
    Shear stress for cast iron = 8 mpa
    Draw a neat sketch of the coupling.

14. Design a knuckle joint to withstand an axial load of 90 KN. All the parts are made up of mild steel having permissible stresses of 75 mpa in Tension,50 mpa in shear and 90 mpa in compression. Draw a neat sketch of the joint.

15. A power screw is used to raise a load of 10 KN. The normal diameter is 60 mm and the pitch is 9 mm. The threads are ACME type ($2\theta = 29°$) and the coefficient of friction at the screw threads is 0.15. Neglecting collar friction. Calculate.

    a) The Torque required to raise the load.

    b) The torque required to lower the load.

    c) The efficiency of the screw for lifting the load.

2

PART – B

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2

16. A triple riveted Butt joint coile zig-zag riveting is used to connect two plates of 6 mm. thickness. Design the joint fully and show how it may fail. Take $\sigma_t = 120 N/mm^2$, $\sigma_c = 150 N/mm^2$ and shear stress $\tau = 100 N/mm^2$.

17. Write short notes on :

a) The factors to be considered while selecting the factor of safety.

b) Stress concentration.

c) Bolt of uniform strength.

3

800