Code No. : **3048**

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

Time: 3 Hours]   [Max. Marks: 75

Note : i) *Answer* **all** *questions from Part – A. Answer* **five** *questions from Part – B.*

ii) *Provide* **neat** *proportional freehand sketches for* **all** *the designs.*

PART – A   (25 Marks)

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

2. Differentiate between Induced stress and Allowable stress.   2

3. Briefly explain miner's rule.   2

4. What is stress concentration ? Suggest some methods to reduce stress concentration.   3

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

6. What is Kennedy Key ? What is its application ?   3

7. What is the purpose of using a gib along with a cotter in a cotter joint ?   2

8. What is meant by a bolt of uniform strength ?   2

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 lengths   b) Throat thickness of a weld section.   3

PART – B   (50 Marks)

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 of tensile test gives a yield limit of 284 mpa.

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PART – A   (25 Marks)

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

2. Differentiate between Induced stress and Allowable stress.   2

3. Briefly explain miner's rule.   2

4. What is stress concentration ? Suggest some methods to reduce stress concentration.   3

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

6. What is Kennedy Key ? What is its application ?   3

7. What is the purpose of using a gib along with a cotter in a cotter joint ?   2

8. What is meant by a bolt of uniform strength ?   2

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 lengths   b) Throat thickness of a weld section.   3

PART – B   (50 Marks)

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 of 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 clockwise to 100 N.M counter clockwise. Determine the shaft diameter for the following data. Factor of safety = 2 ultimate strengths = 560 mpa ; yield stress = 320 mpa. Endurance 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 70 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 15 KN. The normal diameter is 60 mm and the pitch is 9mm. The threads are square threads and coefficient of friction at the screw threads is 0.15, neglecting collar friction, calculate.
    a) Torque required to raise the load
    b) Torque required to lower the load.
    c) The efficiency of the screw for lifting the load.

16. A triple riveted lap joint with zig-zag riveting is used to connect two plates of 8 mm thickness.

    Design the joint fully and show how it may fail. Take σ_t = 120 N/mm^2, σ_c =150 N / mm^2 and shear stress τ = 100 N/mm^2.

17. Write short notes on :
    a) The factors to be considered while selecting the factor of safety.
    b) S-N diagram and endurance limit.
    c) Bolt of uniform strength.