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Kharghar, Navi Mumbai - 410 210.

Mechanical Department

Name of Programme: - ME

Name of Course: - Design of Machine Elements (SEM-VI 2017-18)

Course Outcome. – C604.1: Analyze and evaluate the loads, forces, stresses involved in components and decide the dimensions.

Assignment –I

1. What is factor of safety? Define it for brittle & ductile loading.
2. State and describe in brief about ergonomic considerations in the designing of machine elements.
3. Write down the steps involved in a general design procedure in machine design.
4. What is stress concentration? State its effect on the material in case of static loading and cyclic loading.
5. Explain aesthetic consideration while designing the product.
6. Explain different types of stresses.
7. Draw and explain stress-strain diagram for ductile and brittle material.
8. State factors that govern 'factor of safety'.

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Course coordinator: - Mr. Vishal Pawar. (TYME-A and B)

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Mechanical Department

Name of Programme: - ME

Name of Course: - Design of Machine Elements (SEM-VI 2017-18)

Course Outcome. – C604.2:- Select design criteria for different machine components.

Assignment –II

1. Write the design procedure for cotter joint.
2. Write the design procedure for knuckle joint.
3. Write the design procedure for turn buckle.
4. Differentiate between Knuckle joint and Cotter joint.
5. Explain the design procedure of hand lever with neat sketch.
6. Design an offset link for a load of 1000 N. Maximum permissible stress in tension for link material is 60 N/mm2. Assume b = 3t for rectangular cross section of the link.
7. Design ‘‘C’’ clamp frame for a total clamping force of 20 kN. The cross-section of the frame is rectangular and width to thickness ratio is 2. The distance between the load line and natural axis of rectangular cross section is 120 mm and the gap between two faces is 180 mm. The frame is made of cast steel for which maximum permissible tensile stress is 100 N/mm2.
8. Design a knuckle joint to transmit 150 KN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression.

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Kharghar, Navi Mumbai - 410 210.

Mechanical Department

Name of Programme: - ME

Name of Course: - Design of Machine Elements (SEM-VI 2017-18)

Course Outcome. – C604.3: Select proper material for machine components

Assignment –III

1. A hollow shaft for a rotary compressor is to be designed to transmit maximum torque of 4750 N-m. The shear stress in the shaft is limited to 50 MPa. Determine the inside outside diameter of the shaft if the ratio of inside to outside diameter of the shaft is 0.4.
2. Define : a) Ductility b) Toughness c) Creep
3. Design a bushed pin type flexible coupling for connecting a motor shaft to a pump shaft for the following service conditions. Power to be transmitted = 40 KW. Speed of the motor shaft = 1000 RPM. Diameter of the motor shaft = 50 mm Diameter of the pump shaft = 45 mm The bearing pressure in the rubber bush and allowable stress in the pins are to be limited to 0.45 N/mm2 and 25 MPa respectively.
4. State and explain reasons for adopting involute curves for a gear tooth profile.
5. Draw neat sketch of a protected type flanged coupling showing all details.
6. Why are bushes of softer material inserted in the eyes of levers?
7. What are the considerations in design of dimensions of formed and parallel key having rectangular cross section?
8. A shaft 30 mm. diameter is transmitting power at a maximum shear stress of 80 MPa. If a pulley is connected to the shaft by means of a key, find the dimension of the key so that stress in the key is not to exceed 50 MPa and length of the key is 4 times the width.

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Course coordinator:- Mr. Vishal Pawar. (TYME-A and B)

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Mechanical Department

Name of Programme: - ME

Name of Course: - Design of Machine Elements (SEM-VI 2017-18)

Course Outcome. – C604.4: Identify various modes of failure of machine components under different load patterns.

Assignment –IV

1. Show that the efficiency of a self-locking screw is less than 50%.
2. What is self-locking property of threads and where it is necessary?
3. Explain the terms self-locking and overhauling of screw.
4. Draw profiles to square and Acme threads with full details. Which one is stronger?
5. A screw jack is used to lift a load of 50 kN through a maximum lift of 200 mm. The material used for a screw is steel of allowable stresses in tension and compression as 100 N/mm2 and 50 N/mm2 respectively. The pitch of screw is 8 mm. The nut is made of phosphor bronze with allowable stresses as 50 N/mm2 and 45 N/mm2 in tension and crushing. The allowable shear stress for nut material is 40 N/mm2. The allowable bearing pressure between nut and screw is not to exceed 20 N/mm2. If the coefficient of friction between screw and nut is 0.14, design the screw and nut.
6. A power screw on a machine has single start square thread with a non-rotating bronze nut. Axial force on the screw is 15 kN. Allowable stresses for screw material in compression and shear are 85 MPa and 37 MPa respectively. Allowable bearing pressure for the screw nut pair is 5 MPa. Find (i) Core diameter of screw (ii) Length of the nut (iii) Efficiency of power screw in coefficient of friction between screw and nut is 0.12. (iv) Shear stresses in the threads of screw and nut.
7. State disadvantages of screwed joints

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Course coordinator: - Mr. Vishal Pawar. (TYME-A and B)

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Mechanical Department

Name of Programme: - ME

Name of Course: - Design of Machine Elements (SEM-VI 2017-18)

Course Outcome. – C604.5: Use design data book and different IS codes for design.

Assignment –V

1. State areas of application of springs.
2. A close coiled helical compression spring of 12 active coils has a spring stiffness k. It is cut into two springs having 5 and 7 turns. Determine the spring stiffness of resulting springs.
3. Define the following terms with respect to springs: (1) Spring index (2) Spring stiffness (3) Free length of spring (4) Solid length of spring.
4. A safety valve of 60 mm diameter is to blow off at a pressure of 1.2 N/mm2. It is held on its seat by a close coiled helical spring. The maximum lift of the valve is 10 mm. Design a suitable compression spring of spring index 5 with an initial compression of 35 mm. The shear stress for spring material is limited to 500 MPa. Take G = 80 kN/mm2.
5. Draw a neat sketch of leaf spring of semi-elliptical type and name its parts.
6. A railway wagon having 1500 kg mass and moving at 1 m/s velocity dashes against a bumper consisting of two helical springs of spring index 6. The springs, which get compressed by 150 mm while resisting a dash made of spring steel having allowable shear stress of 360 N/mm2 and modulus of rigidity 8.4 * 10^4 N/mm2. Design the helical coil spring with circular cross Section of spring wire.

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Course coordinator:- Mr. Vishal Pawar. (TYME-A and B)

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Mechanical Department

Name of Programme: - ME

Name of Course: - Design of Machine Elements (SEM-VI 2017-18)

Course Outcome. – C604.6: Select standard components with their specifications as per design.

Assignment –VI

1. Describe 'bolt of uniform strength' with neat sketch.
2. State advantages and disadvantages of welded joints over riveted joints.
3. Determine the size of bolt in the cylinder head of a steam engine. The engine cylinder has a bore of 400 mm and the maximum steam pressure to which the cylinder is subjected is 1.5 N/mm2. Cylinder head is held on the cylinder by 16 number of bolts. The permissible tensile stress for the bolt material is 25 N/mm2.
4. State engineering applications of each of Acme and Buttress thread profiles with neat sketches.
5. Derive strength equation for parallel fillet weld subjected to tensile load.
6. Merits and demerits of screwd and welded joints

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Course coordinator:- Mr. Vishal Pawar. (TYME-A and B)

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Mechanical Department

Name of Programme: - ME

Name of Course: - Design of Machine Elements (SEM-VI 2017-18)

Course Outcome. – C604.7 : Use design data book and different IS codes for design.

Assignment –VII

1. Define following terms as applied to rolling contact bearings: 1) Basic static load rating 2) Basic dynamic load rating 3) Limiting speed
2. List important physical characteristics of good bearing material.
3. What are rolling contact bearings? State their advantages over sliding contact bearings.
4. Define the following terms related to bearings: (a) Bearing characteristics number (b) Bearing modulus (c) Critical pressure (d) Sommerfeld number.
5. What procedure is followed, step-by-step in designing a journal bearing?
6. State the applications of following bearings with suitable reasons: (i) Deep grove ball bearing (ii) Taper roller bearing (iii) Thrust coller bearing (iv) Needle roller bearing.

Last Date Of submission: 09/03/2018

Course coordinator:- Mr. Vishal Pawar. (TYME-A and B)