

**B.Tech. MECHANICAL ENGINEERING
(BTMEVI)**

Term-End Examination

June, 2014

BIME-008 : MACHINE DESIGN - I

Time : 3 hours

Maximum Marks : 70

Note : *Attempt any five questions. All questions have equal marks. Assume missing data suitably, if any. Use of Design Data Handbook and scientific calculator is allowed.*

1. How the mechanical fastener are classified ? 14
What is the difference between the rivetted structural joints and pressure vessels ? Design a knuckle joint to transmit 20 kN in tension.

2. What is cumulative damage in fatigue ? How the residual stresses are helpful in designing for fatigue ? 14
A semi-elliptic leaf spring consists of two extra full length leaves and six graduated length leaves, including the master leaf. Each leaf is 7.5 mm thick and 50 mm wide. The centre to centre distance between the two eyes is 1 m. The leaves are pre-stressed in such a way that when the load is max. the stress induced in all the leaves are equal to 350 N/mm². Determine the safe maximum load for the spring.

3. What is the difference between a cotter and a key ? State the advantages and limitations of a cotter joint. Figure 1 below shows the rivetted joint with an eccentric load of 15 kN. The rivets are 24 mm in diameter. Find the max shear stress induced in the rivet. If the thickness of the plate is 15 mm, determine the crushing stress on the rivet. 14

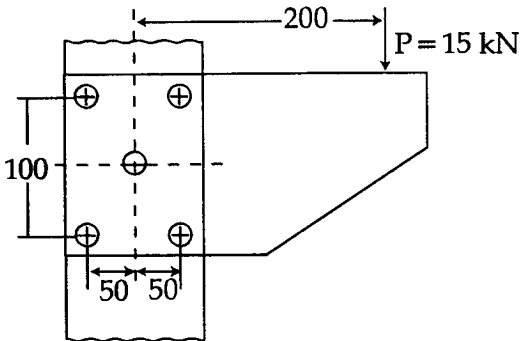


Figure 1.

4. What are the common functions and applications of the springs ? Design a lead screw of a lathe, which has single start ISO-metric threads of 52 mm nominal dia. and 8 mm pitch. The screw is required to exert an axial force of 2 kN. The thrust is carried on a collar of 100 mm O.D. and 60 mm I.D. Determine the power required to drive the lead screw and the efficiency of the screw. 14
5. Design a bushed pin type flexible coupling to connect the output shaft of an electric motor to the shaft of a centrifugal pump. The motor delivers 20 kW power at 720 rpm. The starting torque of the motor may be assumed to be 150% of the rated torque. 14

6. Draw the flow diagram for a systematic design procedure. What is meant by design for manufacture ? Explain and discuss how this design can be computerized. 14
7. Write short notes on the following : 7x2=14
- (a) Stress concentration
 - (b) Hydraulic press
 - (c) Reverse engineering
 - (d) Pneumatic press
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