Exam.Code:0941
Sub. Code: 6721

2074

B.E. (Mechanical Engineering)

Fifth Semester

MEC-501: Design of Machine Elements - I

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. 1 (section-A) which is compulsory and selecting two questions each from Section B-C.

Section – A (2 marks each)

1. a) List the factors required to be taken into account for the selection of materials.
   b) What are the disadvantages of a third class lever.
   c) Distinguish between Chain and Zig-Zag riveted joint.
   d) What are the advantages and disadvantages of pin type flexible coupling.
   e) What do you understand by overhauling and self-locking screws.

Section – B (10 marks each)

2. A double riveted lap joint is to be made between **9 mm** plates. The safe working stresses for plates and rivet materials are σ_t = **80 N/mm²**, σ_c = **120 N/mm²**, τ = **60 N/mm²** . Design the riveted joint.
3. 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.
4. Design a right angled bell crank lever. The horizontal arm is **500 mm long** and a load of **4.5 kN** acts vertically downward through a pin in the forked end of his arm. At the end of the **150 mm** long arm which is perpendicular to the **500 mm** long arm, a force P act at right angles to the axis of **150 mm** arm through a pin into a forked end. The lever consists of forged steel material and a pin at the fulcrum. Take the following data for both the pins and lever material: Safe stress in tension = **75 MPa**; Safe stress in shear = **60 MPa**; Safe bearing pressure on pins = **10 N/mm²**.

Section – C (10 marks each)

5. Design completely an oval flanged pipe joint for pipes of internal diameter **150 mm** subjected to fluid pressure of **8.5 N/mm²**.The maximum tensile stress in the material is not to exceed 64 **N/mm²**. The material of pipe is cast iron. The test pressure for the pipe joint is **23 N/mm²**. Also, draw the sketch of the oval flanged pipe joint.

P.T.O.

6. Design a clamp coupling to transmit **30 kW** at **100 r.p.m**. The allowable shear stress for the shaft and key is **40 MPa** and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolts is **70 MPa**. The coefficient of friction between the muff and the shaft surface may be taken as **0.3.**

7. Design and sketch the front sectional view of a screw jack for lifting a load of **50 kN** through a height of **0.4 m**. The screw is made of steel and nut of bronze. The following allowable stresses may be assumed.

   For steel : Compressive stress = **80 MPa** ; Shear stress = **45 MPa**

   For bronze : Tensile stress = **40 MPa** ; Bearing stress = **15 MPa**; and

   Shear stress = **25 MPa**.

   The coefficient of friction between the steel and bronze pair is **0.12**. The dimensions of the swivel base may be assumed proportionately. The screw should l ave square threads. Design the screw, nut and handle. The handle is made of steel having bending stress **150 MPa** (allowable).

x-x-x