BIME-008

B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

ロロ656   **June, 2015**

BIME-008 : MACHINE DESIGN – I

*Time : 3 hours*   *Maximum Marks : 70*

*Note : Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is allowed. Use of Machine Design Data Book is permitted.*

1. (a) Explain the different types of riveted joints with neat sketches.

    (b) Discuss the basic design requirements for machine elements.   7+7

2. Design a cotter joint, made from 0·2% carbon steel to support a load of 30 kN which is subjected to slow reversals of direction.   14

3. A concentric spring for an aircraft engine valve is to exert a maximum force of 500 N under an axial deflection of 20 mm. Design the spring.   14

4. Design a shaft to transmit power from an electric motor to a lathe head stock through a pulley by means of a horizontal belt drive. The pulley weighs 20 kg and is located at 100 mm from the centre of the nearest bearing. Diameter of the pulley is 200 mm. Maximum power transmitted is 1·5 hp. Angle of lap of the belt is 180° and the coefficient of friction between belt and pulley is 0·3. Shock factors in bending and torsion are 1·5 and 2 respectively. Allowable shear stress in the shaft is 35 kN/mm². The pulley is mounted overhung on the shaft.   14

5. Two shafts, 100 mm diameter are to be connected by means of two cast iron couplings. The allowable shearing stress of the bolt material is 45 N/mm². The allowable shearing stress of the shaft material is 55 N/mm². Find the size of the bolts to be used. Check the flange for the induced crushing stress.   ·14

6. A plate 75 mm wide and 12·5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in Figure 1.

P◄ ─── 75 mm ─── ►P
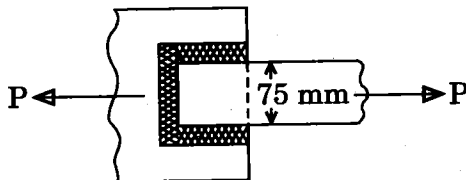
Figure 1

The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loading.   14

7. (a) What is the function of a power screw ? What is "self-locking" of power screws ? How is it related to helix angle of the screw ?

   (b) What are the factors to be considered for selection of materials for the design of machine elements ? Discuss.   7+7