* U F - 8 1 2 3 *

UF-8123

B. E. - II (Sem. III) (Mechanical) Examination

May / June – 2012

Machine Design & Industrial Drafting

(New Syllabus)

Time : **3** Hours] [Total Marks : **100**

Instructions : (1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 2 (SEM. 3) (MECHANICAL)

Name of the Subject :

☛ MACHINE DESIGN & INDUSTRIAL DRAFTING (NEW)

☛ Subject Code No. : 8 1 2 3 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Assume suitable data if necessary.

(3) Figures to the right indicate full marks.

(4) Programmable calculator is not allowed.

(5) Attempt all questions.

1 Answere the following questions : **20**

(a) Answere any five : **10**

(i) Define stress concentration.

(ii) bearing stress

(iii) List application of welded joint.

(iv) List possible failures of welded joint.

(v) Define fits and tolerance.

(vi) Explain chemfering command in Auto-CAD.

(vii) Explain trimming command in Auto-CAD.

(viii) Define maximum shear stress theory of failure.

(b) A wall bracket with a rectangular cross section is shown in Fig 1. The depth of the cross section is twice of the width. The Force P acting on the bracket at 60° to the vertical is 5 kN. The mateial of the bracket is grey cast iron FG 200 ($\sigma_{ultimate}$ = 200 MPa) and the factor of safety is 3.5. Determine the dimensions of the cross-section of the bracket. Assume maximum principle stress theory of failure. **10**

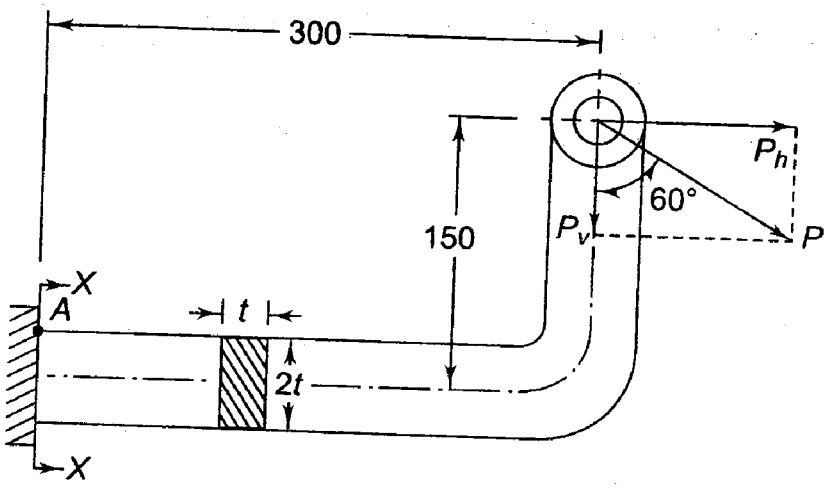

Fig-1

2 Answer the following : **15**

Design a cotter joit to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically.

Tensile stress = compressive stress = 50 MPa (safe tensile stress)

Shear stress = 35 MPa (safe shear stress)

Crushing stress = 90 MPa (Safe crushing stress)

OR

2 The bracket as shown in Fig. 2 is to carry a load of 45 kN. Determine the size of the rivet if the shear stress is not to exceed 40 MPa. Assume all the rivets of same size. **15**

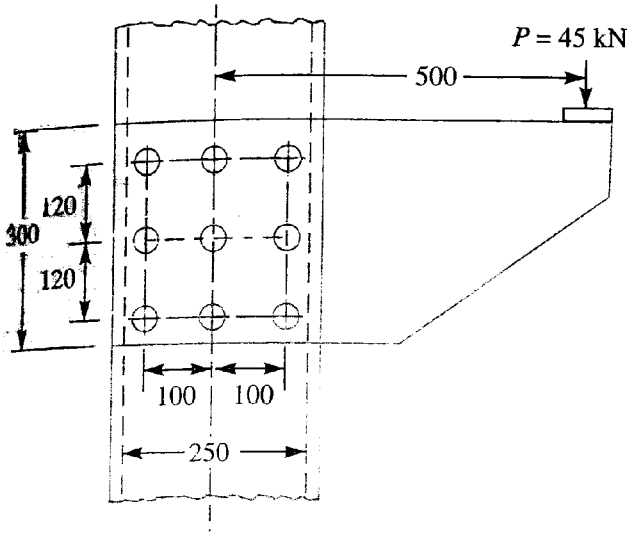

Fig - 2

3 For operating the exhaust valve of a petrol engine, the maximum load required on the valve is 5000 N. The rocker arm oscillates around a pin whose centre line is 250 mm away from the valve axil. The two arms of the rocker are equal and make an included angle of 160°. Design the rocker arm with the fulcrum if the tensile stress is 70 MPa and the bearing pressure is 7 MPa. Assume the cross-section of the rocker arm as rectangular. **15**

4 Attempt any four : **20**

(i) Discuss the function of a coupling. Give at least three practical applications.

(ii) Distinguish clearly, giving examples between pin, axle and shaft.

(iii) A hollow shaft has greater strength and stiffness than solid shaft of equal weight. Explain.

(iv) What is the surface roughness ? Write down its characteristics and draw its symbol.

(v) Show that the efficiency of self locking screws is less than 50 percent.

(vi) What is a key ? State its function.

5 Draw the Toggle jack and explain the design procedure of Toggle jack in detail. **15**

OR

5 A C-clamp, as shown in Fig. 1, has trapezoidal threads of 12 mm outside diameter and 2 mm pitch. The coefficient of friction of screw threads is 0.12 and for the collar is 0.25. The mean radius of the collar is 6 mm. If the force exerted by the operator at the end of the handle is 80 N, find **15**

(i) The length of handle

(ii) The maximum shear stress in the body of the screw and where does this exist and

(iii) The bearing pressure on the threads.

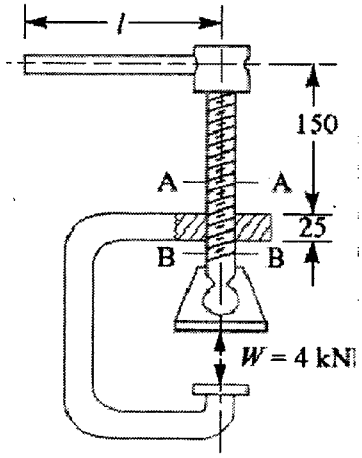

FIG 1

6 A steel solid shaft transmitting 15 kW at 200 r.p.m. is suported on two bearings 750 mm apart and has two gears keyed to it. The pinion having 30 teeth of 5mm module is located 100 mm to the left of the right hand bearing and delivers power horizontally to the right. The gear having 100 teeth of 5mm module is located 150 mm to the right of the left hand bearing and receives power in a vertical direction from below. Using an allowable stress of 54 MPa in a shear, determine the diameter of the shaft. **15**

OR

6 Design a protective type of cast iron flange coupling for a steel shaft transmitting 15 kW at 200 r.p.m. and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. The shear stress for cast iron is 14 MPa. **15**