B.E / B.TECH (FULL TIME) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2011
MECHANICAL ENGINEERING BRANCH
VI SEMESTER (REGULATION 2004)
ME 381 - DESIGNS OF JIGS, FIXTURES AND PRESS TOOLS

Time: 3 Hours Max. Marks: 80

Note: i) Use of Approved Design Data Books permitted
ii) Drawing sheets will be provided
iii) Drawings need not be drawn to scale but should follow standards.
iv) Assume missing dimensions suitably

PART-A **(10 x 2 = 20 Marks)**

1. What are the advantages of using Jigs and Fixtures?
2. Explain the use of a V-Block for location purposes. How many degrees of freedom are arrested by a V-Block?
3. With a neat sketch explain the working of a simple strap clamp.
4. What is a slip Bush? When is it used?
5. What is the function of a tenon? How is it used in a fixture?
6. What are the different types of presses used in sheet metal applications? Which type of press is suited for drawing and forming applications?
7. How is the tonnage requirement for a blanking and piercing die determined? What are the means of reducing the tonnage requirement?
8. Explain the difference between direct and indirect knock out?
9. What is meant by bend allowance? How is it computed?
10. How is the number of stages required for drawing determined?

PART-B **(5 x 16 = 80 Marks)**

11.a) i) With suitable examples explain the principles of location. (10 marks)
ii) Explain how and why a C- washer is used in Jigs and fixtures. (6 marks)

12.a) Design a drilling jig for use when drilling the two ϕ30 holes in the component shown in Fig. 1.Assume that the base has been machined.
i) Draw two views of the Jig.
ii) Specify appropriate fits and tolerances for critical parts.
iii) Dimension the views.
iv) Give a neat parts list.

(OR)

12.b) Design a drilling jig for use when drilling the ϕ16 and ϕ12 holes in the component shown in Fig. 2.Assume that the base has been machined.
i) Draw two views of the Jig.
ii) Specify appropriate fits and tolerances for critical parts.
iii) Dimension the views.
iv) Give a neat parts list.

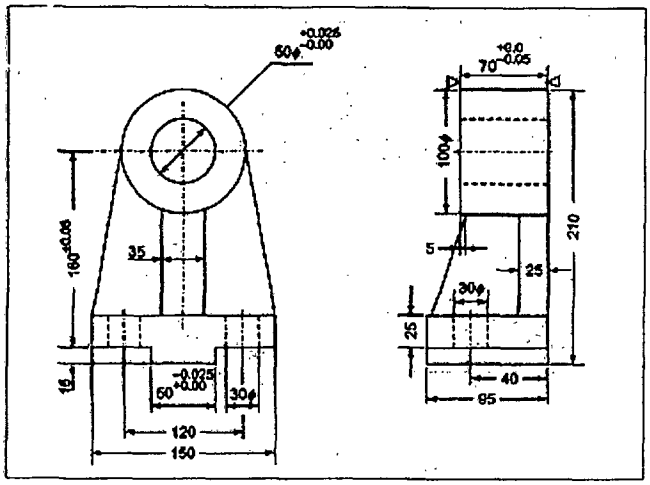

Fig 1

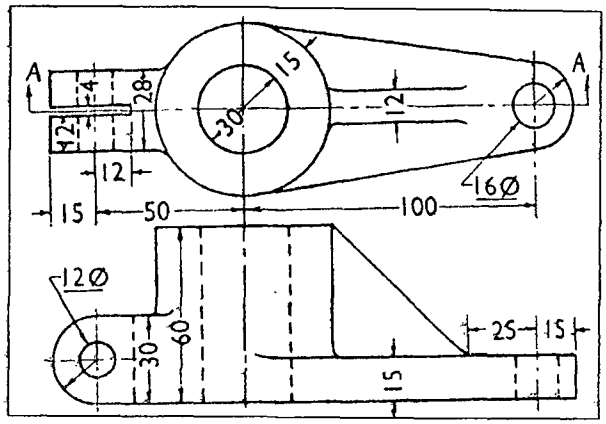

Fig 2

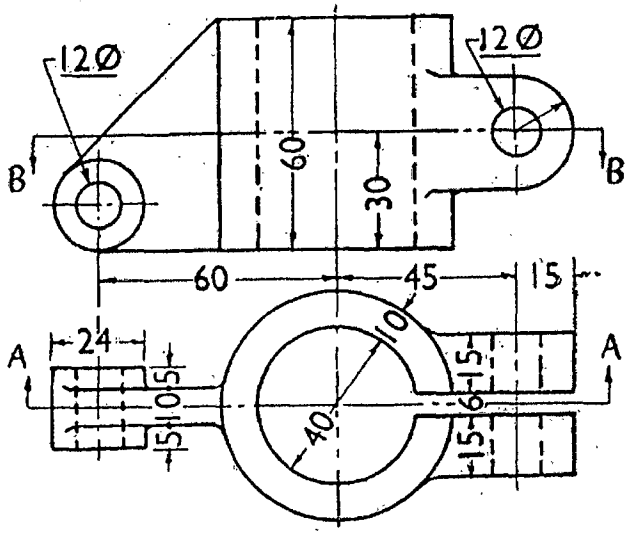

Fig 3

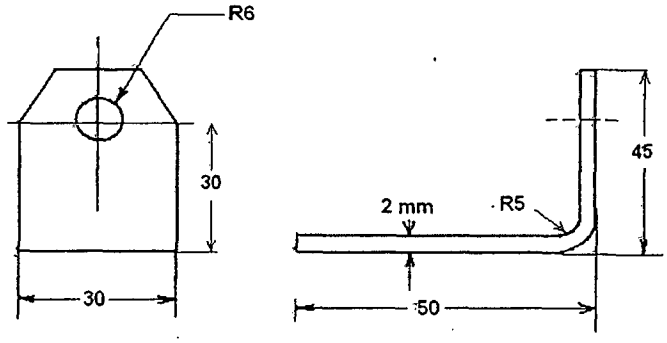

Fig 4

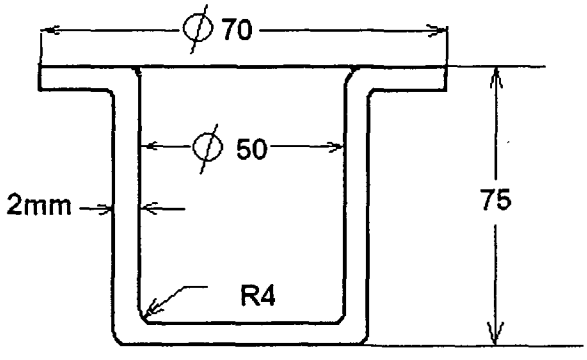

Fig 5

13. (a) (i) Compare and contrast meter-in and meter-out flow control valve systems for operation of double acting hydraulic cylinder. (8)

(ii) Draw a circuit for automatic reciprocation of double acting cylinder using sequence valve. (4)

(iii) A double acting cylinder is hooked up in the regenerative circuit. The relief valve setting is 105 bars. The piston area is 130 cm^2 and the rod area is 65 cm^2. If the pump flow is 0.0016 m^3/s, find the cylinder speed and load carrying capacity for the extension stroke and retracting stroke. (4)

(OR)

(b) (i) Punching operation involved use of high force for shorter duration in sheet metal forming. Design a hydraulic system to perform the punching operation with use of two pumps, one having high pressure and low discharge and other having low pressure and high discharge. (8)

(ii) Brief on an electro-hydraulic circuit for regenerative operation of double acting cylinder. (8)

14. (a)(i) Design a circuit for pneumatic cylinder with two handed safety measure. (6)

(ii) Based on the truth table (Table 1) of moving part logic control function, draw the logic circuit. (10)

Table 1

Input			Output
a	b	c	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

(OR)

(b) (i) Discuss on the Filter-Regulator-Lubricator unit of a pneumatic system. (12)

(ii) Air is used at a rate of 1.0 m^3/min from a receiver at 40°C and 1000 kPa gage. If the atmospheric pressure is 101 kPa abs and the atmospheric temperature is 20°C, how many m^3/min of free air must the compressor provide. (4)

15. (a) (i) Design a pneumatic system involving two cylinders to achieve sequence of $A^+B^-B^+C^-C^+A^-$ using cascade method.

(OR)

(b) (i) Brief on the causes of hydraulic system failures. What are the symptoms and the necessary preventative measures.

Part – B (5 x 16 = 80 Marks)

11 Steam at 11 bar and 100°C superheat expands through a convergent-divergent nozzle. The back pressure of the nozzle is 0.15 bar. Find the flow rate of steam through the nozzle per hour if the diameter of the nozzle at the exit is 3.5 cm. Neglect the friction. If 60% of the total enthalpy drop in the nozzle is converted into useful work by the turbine, determine the power developed by the turbine. **(16)**

12 a. A single-acting, two stage air compressor deals with air at atmospheric condition of 1.013 bar and 20°C. At suction the pressure is 1 bar and the temperature is 30°C. The final delivery pressure is 17.5 bar, the inter-stage pressure is 4 bar and perfect inter-cooling is to be assumed. If the low pressure cylinder bore is 230 mm. common stroke is 150 mm and the speed of compressor is 350 rpm. Calculate: (a) the volume of atmospheric air dealt with per minute, and (b) the power of driving motor. The clearance volume of low pressure cylinder is 4% of the swept volume and mechanical efficiency of the unit is 85%. The law of compression and expansion for both stages is $pv^{1.25}$ = constant. Calculate the efficiency of compression compared to isothermal compression from atmospheric pressure and temperature **(16)**

(Or)

b. A two-stage double acting air compressor delivers air at a rate of 1.35 kg/sec. The suction pressure is 1 bar and inter-stage pressure is 7 bar and delivery pressure 42 bar. Air enters the L.P cylinder at 17°C and cooled in the inter cooler to 32°C.The clearance in L.P and H.P cylinders are 6% and 8% of the respective strokes. The law of compression and re-expansion is $pv^{1.21}$ = C. in both cylinders. Speed of the compressor is 500 rpm. Find (i) The amount of cooling water required per minute in intercooler, if rise in temperature of water is limited to 20°C. (ii) Power required. (iii) D and L of the L.P cylinder if L=D. **(16)**

13 a. Explain with neat sketch the construction and working principle of Vapour compression and Vapour absorption refrigeration systems. **(16)**