(viii) A meter-out circuit controls the speed of a cylinder during
(a) retraction stroke (b) extending stroke
(c) both (a) and (b) (d) unloading.

(ix) Push button switches are used in
(a) mechanically controlled fluid power circuits
(b) manually controlled fluid power circuits
(c) electrically controlled fluid power circuits
(d) both (a) and (c).

(x) A Flow Control Valve generally includes a check valve for
(a) better accuracy (b) pressure compensation
(c) free flow in opposite direction (d) safety against high pressure.

Group – B

2. (a) The hydraulic jack, shown in Fig.1, is filled with oil. The large and small pistons have diameters of 75 and 25 mm, respectively. What force on the handle is required to support a load of 9000 N? If the force moves down by 500 mm, how far is the weight lifted?

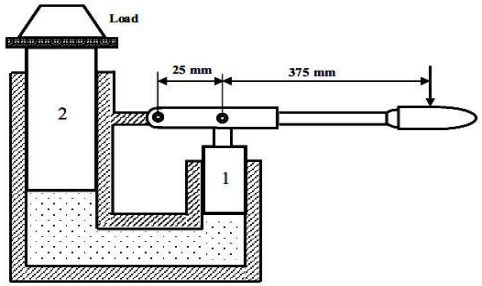

Fig.1

(b) With sketch, explain the working principle of a radial piston pump for hydraulic systems.

6 + 6 = 12

3. (a) (i) Briefly discuss the primary functions of a hydraulic fluid.
(ii) What are the advantages of mineral oil over water as hydraulic fluid?
(iii) Define hydraulic power, and obtain its expression in terms of flow rate and pressure of the system.

(b) Oil with specific gravity 0.9 enters a tee, as shown in Fig.2, with velocity V = 5 m/s. The diameter at section 1 is 10 cm, the diameter at section 2 is 7 cm and the diameter at section 3 is 6 cm. If equal flow rates are to occur at sections 2 and 3, find the velocities V_2 and V_3.

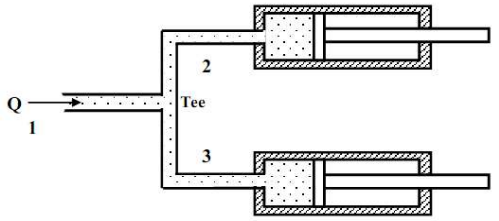

Fig.2

(3 + 2 + 3) +

Group – C

4. (a) Differentiate between a hydraulic pump and a hydraulic m
Explain with a neat sketch the working principle of a gear motor.

(b) A 27000 N weight is being pushed up on an inclined surfac
constant speed by a cylinder, as shown in Fig.3. The coeffici
friction between the weight and the inclined surface equals 0.15.
(i) Determine the required cylinder piston diameter with the
pressure of 6894 kPa.
(ii) Determine the required cylinder piston diameter, if the weigh
accelerate from rest to a velocity of 1.524 m/s in 0.5 se
pressure remaining as given in (i).

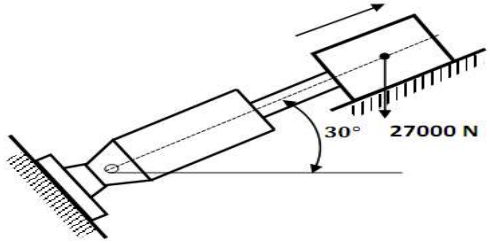

Fig. 3

(2 + 3) + (4 + 3

5. (a) Classify Direction Control Valves. Illustrate with symbol: (i) 3
Direction Control valve, (ii) 4 way Direction Control valve.

(b) Explain the operation of a non-pressure compensated flow control v

(2 + 3 + 3) +

Group – D

6. (a) With the help of a neat sketch describe the operation of a regene
cylinder circuit.

(b) Draw circuit diagram for Speed control of a hydraulic motor.

7 + 5 = 12

7. (a) With neat sketch, explain automatic sequencing of two cylinders.

(b) What are the primary design considerations for hydraulic circuits?

8 + 4 = 12

Group – E

8. (a) Discuss the advantages and disadvantages of pneumatic system compared to hydraulic system. What are the functions of pressure regulator and lubricator used in pneumatic system?

(b) List the components of Piston type reciprocating compressor used in pneumatic system.

(6 + 2) + 4 = 12

9. (a) Write short notes on: (i) Relays, (ii) Solenoid.

(b) With help of a line diagram describe the control of a solenoid actuated cylinder using one limit switch.

(3 + 3) + 6 = 12

FLUID POWER CONTROL
(MECH 3131)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Source for generating high pressure air in a pneumatic system is called
(a) pump (b) actuator (c) compressor (d) blower.

(ii) Pumps employed in fluid power systems are
(a) centrifugal pumps
(b) positive displacement pumps
(c) non-positive displacement pumps
(d) axial flow dynamic pumps.

(iii) A swash plate is attached with a
(a) vane pump (b) rotary piston pump
(c) axial piston pump (d) gear pump.

(iv) Four way Direction Control Valve is used to control
(a) single acting cylinder (b) double acting cylinder
(c) solenoid (d) flow direction within pump.

(v) Cushioning in hydraulic cylinder is done to
(a) prevent shock due to stopping loads at the end of the piston stroke
(b) prevent heat due to seal friction
(c) increase the velocity of the cylinder
(d) prevent overloading of the cylinder.

(vi) A pressure relief valve is normally
(a) open type (b) closed type
(c) both (a) and (b) (d) same as pressure reducing valve.

(vii) Speed of a hydraulic motor depends on
(a) flow rate of oil (b) pressure of oil
(c) viscosity of oil (d) density of oil.