MODEL ANSWER

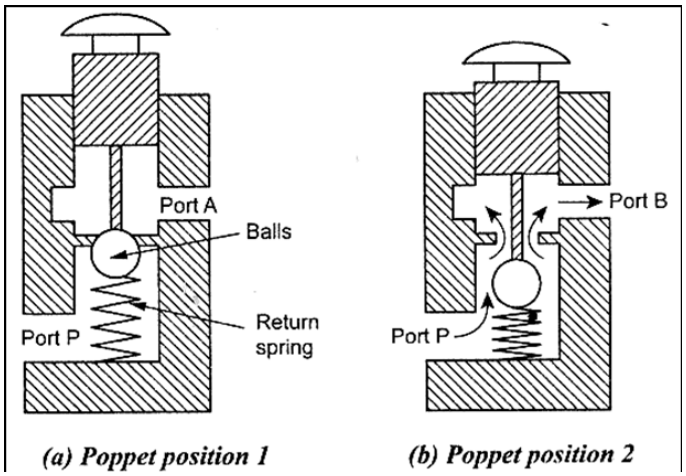
SUMMER– 19 EXAMINATION

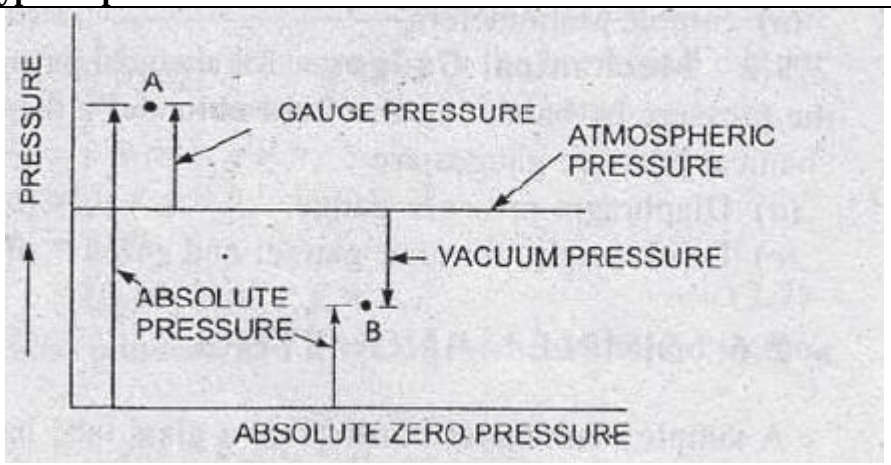
Subject Title: Hydraulic and Pneumatics Subject Code: 17522

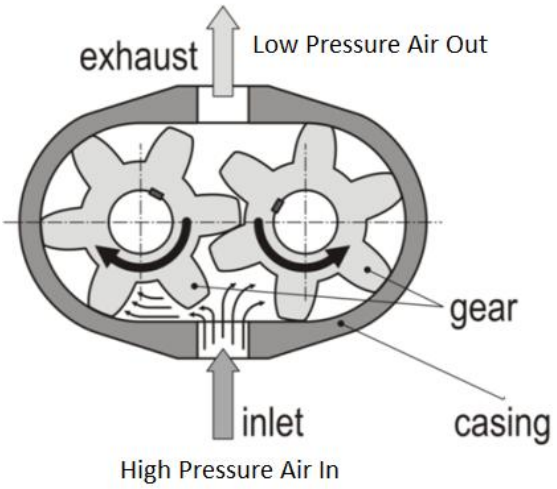
Important Instructions to examiners:

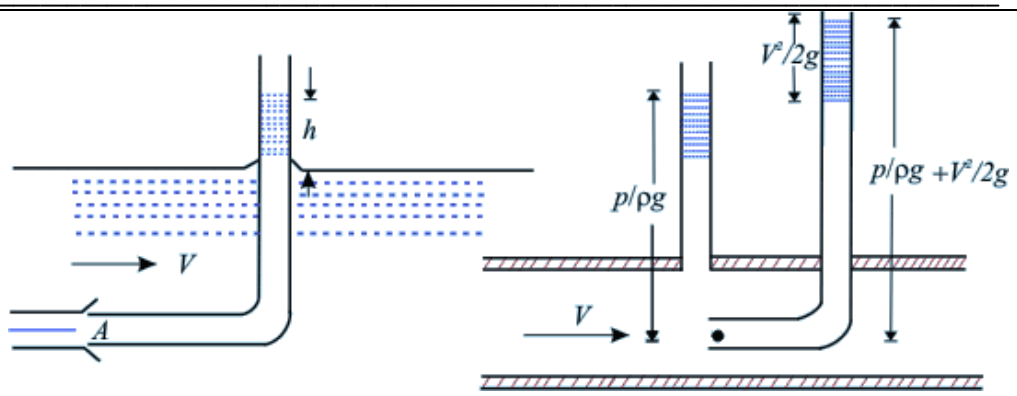
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1	a)	Attempt any THREE OF the following:	12
	i)	Classify of fluids. Give one example of each type.	04
	Ans:	**Classification of fluid with example:** 1. Ideal Fluid: - The fluid which does not show the property like viscosity & compressibility then fluid is called as Ideas fluid. Example-It is an imaginary fluid such type of fluid does not exist in real world. 2. Real Fluid: - A fluid which shows the property like viscosity, compressibility then such type of fluid is called as real fluid. Example-Generally all fluids are real fluid in world. 3. Newtonian fluid: - The fluids which obeys Newton`s law of viscosity. (or) A fluid whose viscosity does not change with the rate of deformation (or) shear strain is known as Newtonian fluid Example- : water, air, thin motor oil. 4. Non Newtonian fluid: - A fluid which does not obey Newton's law of viscosity. (or) A fluid whose viscosity chages with the rate of deformation (or) shear strain is known as Non Newtonian fluid. Example- : Most Viscous fluid. Non drip paint, Polymer solution, Blood, Solid suspension. 5. Ideal Plastic fluid: - A fluid in which shear stress is larger than yield value of stress and is directly proportional to rate of shear strain (i.e. rate of deformation) (or) velocity gradient. Example- It is an imaginary fluid.	04

	ii)	**List any four features of hoses used in hydraulic and pneumatic circuits.**	04
	Ans:	(Any four features one mark each) Hydraulic hose replaced the ridged pipes and tubes used in early hydraulic and pneumatic circuits because of following features:- 1) It is less costly and Weighs less. 2) It is better able to absorb shock and vibration. 3) It Is easier to route and install. 4) Needs no brazing or specialized bending. 5) Allows for movement between components of equipment. 6) Absorbs sound better. 7) Dampens pressure surges.	1 marks for each features.
	iii)	**Draw a sketch and explain the construction and working of poppet valve.**	04
		In a poppet valve, discs, cones or balls are used to control flow. Figure 1.1 shows the construction of a simple 2/2 normally closed valve. If the push button is pressed, ball will lift off from its seat and allows the air to flow from port P to port B. When the push button is released, spring force and air pressure keeps the ball back and closes air flow from port P to port B. Valve position are shown in Figure 1.1(a) 1.1 (b).  Figure 1.1 Two/Two Ball seat Poppet valve	Sketch 02 marks and explanation 2 marks.
	iv)	**Give classification of pneumatic actuators.**	04
		There are basic three types of pneumatic actuator: i) Linear Actuator or Pneumatic cylinders ii) Rotary Actuator or Air motors iii) Limited angle Actuators. The different classification of the pneumatic cylinders are given below **1. Based on application for which air cylinders are used** i) Light duty air cylinders ii) Medium duty air cylinders	4 marks

		iii) Heavy duty air cylinders **2. Based on the cylinder action** i) Single acting cylinder ii) Double acting cylinder a) Single rod type double acting cylinder b) Double rod type double acting cylinder **3. Based on cylinder's movement** i) Rotating type air cylinder ii) Non rotating type air cylinder **4. Based on the cylinder's design** i) Telescopic cylinder ii) Tandem cylinder iii) Rod less cylinder a) Cable cylinder, b) Sealing band Cylinder with slotted cylinder barrel c)Cylinder with Magnetically Coupled Slide iv) Impact cylinder v) Duplex cylinders vi) Cylinders with sensors	
1	b)	**Attempt any ONE of the following:**	06
	i)	**Draw a neat sketch to show the relation between various pressures. Define each types of pressure.**	06
		 **Atmospheric Pressure**: At the earth surface, the pressure due to the weight of air above the earth surface is called as atmospheric pressure. **Gauge Pressure**: If the pressure is measured above the atmospheric pressure it is called as gauge pressure.(positive pressure) **Vacuum Pressure**: If the pressure is measured below the atmospheric pressure it is called as Vacuum pressure.(negative pressure) **Absolute Pressure**: Absolute Pressure is defined as the pressure which is measure with reference to Absolute zero pressure.(It may be above or below atmospheric pressure) Relation between pressure 1.Gauge pressure = Absolute pressure – Atmospheric pressure	02 marks for sketch 1 marks for each definition of pressure

		2.Vacuum pressure = Atmospheric pressure – Absolute pressure	
	ii)	**Draw a neat sketch of gear type of air motor. State its applications. (any two)**	06
		 Fig.01 sketch of gear type of air motor Application of gear type of air motor.(Any 2) 1) Hand-held tools. 2) Impact wrenches. 3) Pulse tools. 4) Screwdrivers. 5) Nut runners. 6) Drill. 7) Grinders. 8) Sanders.	4 marks for neat sketch. 1 mark for each applications
2		**Attempt any FOUR of the following:**	16
	a)	**Draw a neat sketch and explain construction and working of pitot tube. State how the discharge is measured with pitot tube?**	04
			01 marks sketch. 01 marks Construct

		 Construction: A right angled glass tube, large enough for capillary effects to be negligible, is used for the purpose. One end of the tube faces the flow while the other end is open to the atmosphere. Working: The liquid flows up the tube and when equilibrium is attained, the liquid reaches a height above the free surface of the water stream. Since the static pressure, under this situation, is equal to the hydrostatic pressure due to its depth below the free surface, the difference in level between the liquid in the glass tube and the free surface becomes the measure of dynamic pressure. Therefore, we can write, neglecting friction, $$p_0 - p = \frac{\rho V^2}{2} = h\rho g$$ where *p0, p* and *V* are the stagnation pressure, static pressure and velocity respectively at point A $$V = \sqrt{2gh}$$ Such a tube is known as a **Pitot tube** and provides one of the most accurate means of measuring the fluid velocity. by knowing the value of V we can find the measured the discharge by equation Discharge Q = Area of pipe x V.	ion 01 marks Working 01 marks Discharge
	b)	**Draw a neat sketch of axial piston pump used in hydraulic circuit.**	04
			04

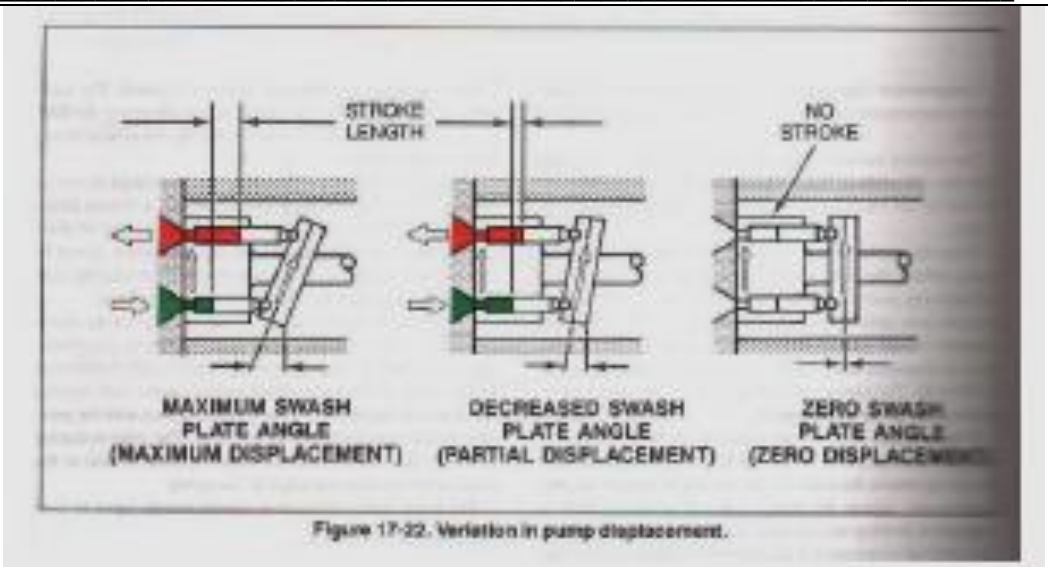


Figure 17-22. Variation in pump displacement.

c) **The centrifugal pump fails to start pumping. Give any four cases and four remedies for the same.** — 04

The centrifugal pump fails to start pumping-(any four causes and remedies) — 1 mark for each

Causes	Remedies
1)Lack of prime	Fill pump and suction pipe completely with liquid.
2) Loss of Prime	Check for leaks in suction pipes joints and fitting.
3) Suction lift too high	If no obstruction at inlet, check for pipe friction losses. measure static lift
4) Speed too low	Check whether motor is directly across the line and receiving full voltage.
5) wrong direction of rotation	Check motor rotation with directional arrow on pump casing.
6) Impeller completely plugged.	Dismantle pump or use piping hand to clean impeller.

d) **Draw neat labeled sketch of hydraulic press. State two application of the hydraulic press.** — 04

Application of Hydraulic Press:- — 02

1) In Sheet forming process
2) Paper Industry
3) Automobile Manufacturing Industry

02

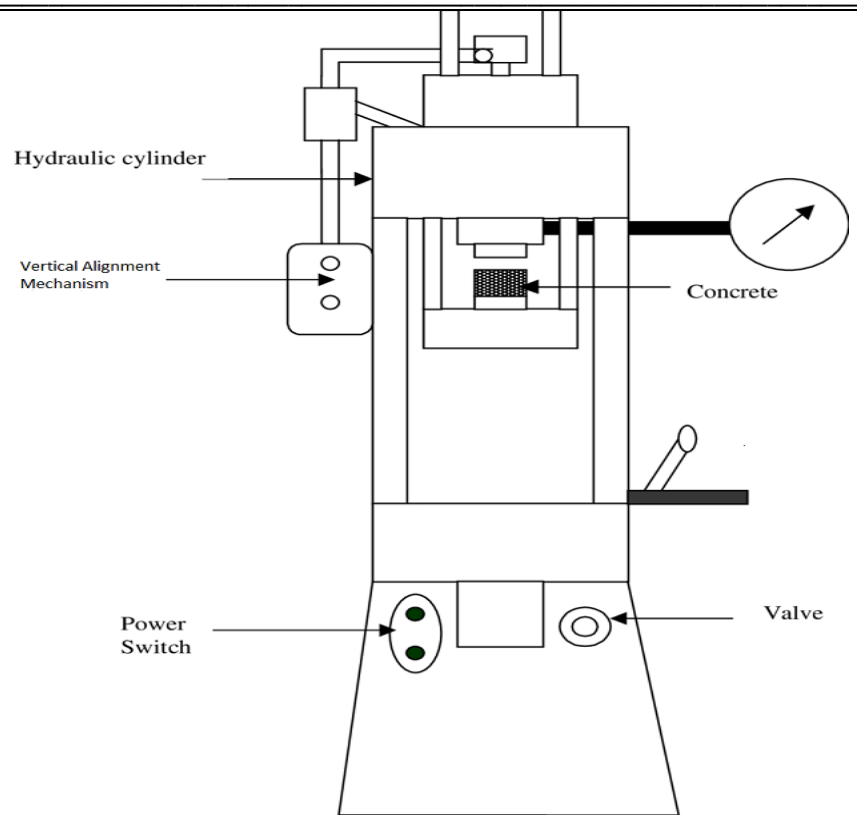
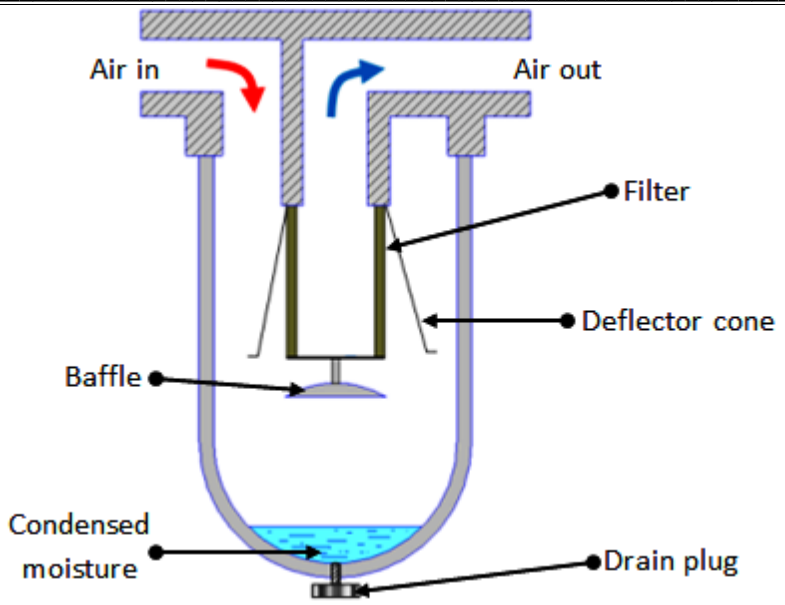
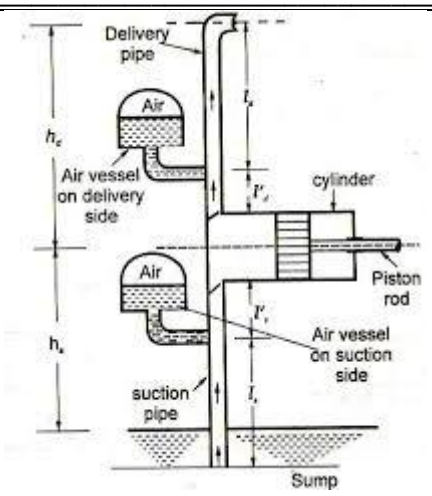
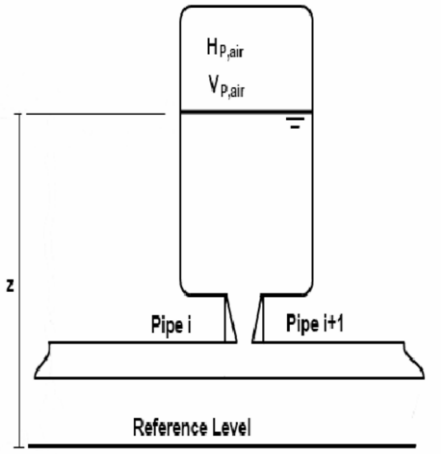


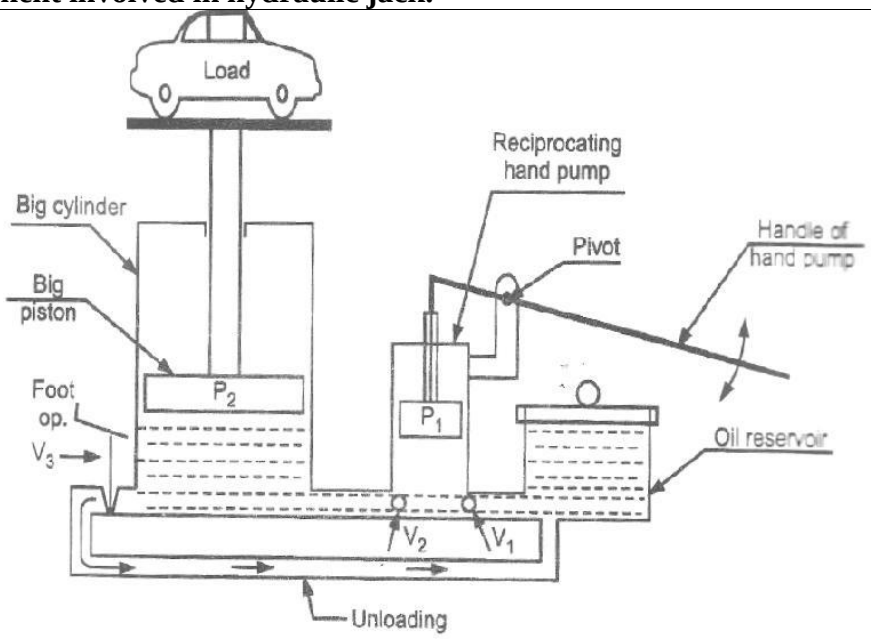
Fig. **Hydraulic press**

	e)	**Explain with neat sketch a mechanical type pneumatic filter.**	04
		Air filter and water trap is used to • prevent any solid contaminants from entering in the system. • condense and remove water vapor that is present in the compressed air. The filter cartridge is made of sintered brass. The schematic of the filter is shown in Fig. The thickness of sintered cartridge provides random zigzag passage for the air to flow-in which helps in arresting the solid particles. The air entering the filter swirls around due to the deflector cone. The centrifugal action causes the large contaminants and water vapor to be flung out, which hit the glass bowl and get collected at the bottom. A baffle plate is provided to prevent the turbulent air from splashing the water into the filter cartridge. At the bottom of the filter bowl there is a drain plug which can be opened manually to drain off the settled water and solid particles.	**02 marks explanation** **02 marks sketch**

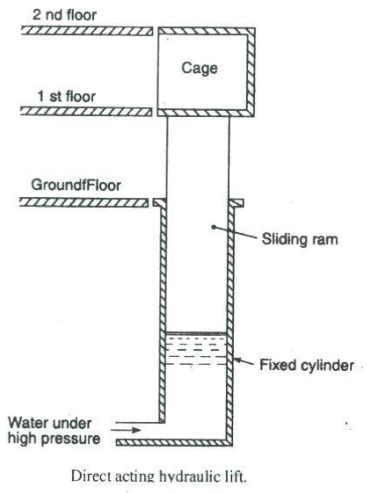
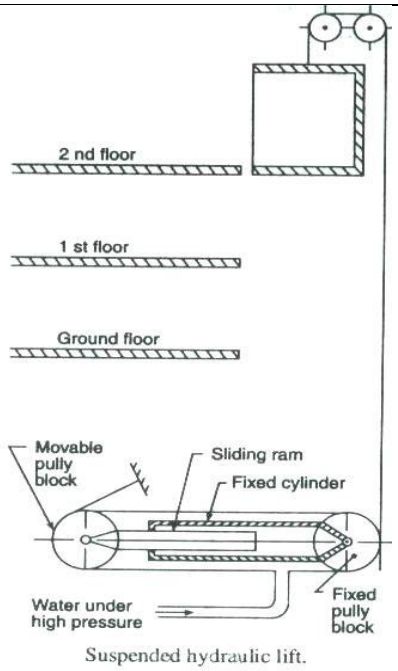
			
3.		**Attempt any FOUR of the following.**	**16**
	a)	**State and explain the basic principles applied in fluid flow.**	**04**
	Ans	**Basic principles applied in fluid flow:** **1) Law of Continuity:** For a fluid flowing through the pipe at all cross section, the quantity of fluid per second is constant. **OR** It states that if an incompressible liquid is continuously flowing through a pipe or a channel whose cross sectional area may or may not be constant then quantity of liquid passing through it per second is same at all sections. **2) Bernoulli's Theorem:** This theorem states that whenever there is a continuous flow of liquid, the total energy at every section remains the same provided that there is no loss or addition of the energy. Mathematically, $\frac{P}{w}+\frac{V^2}{2g}+Z=\text{Constant}$ Where, $\frac{P}{w}$ = Pressure energy, $\frac{V^2}{2g}$ = Kinetic energy, Z= Potential energy	**02 Mark** **02 Mark**
	b)	**Draw neat sketch of air vessel. State its functions and advantages.**	**04**
	Ans		**Sketch- 2 marks;**

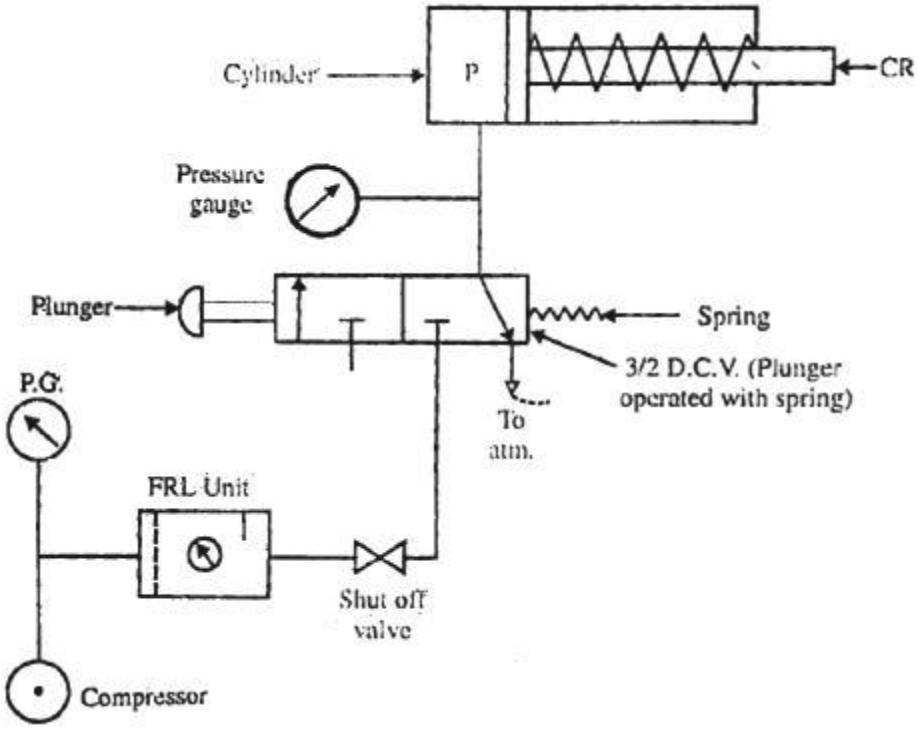
		  **OR** **Sketch of Air vessel** **Functions of air vessel: (any two)** 1. To get more uniform discharge and continuous supply through delivery pipe of reciprocating pump. 2. To save a considerable amount of work in overcoming the frictional resistance in suction and delivery pipe. 3. To reduce the separation. 4. To run the pump at high speed. 5. As velocity is constant the head loss in friction in the pipe also reduces. 6. Length of suction pipe can be increased. 7. It saves large amount of power which is consumed in supplying accelerating head. 8. It also acts as temporary reservoir of liquid or water. **Advantages: (any 2)** 1) Continuous discharge through delivery pipe of reciprocating pump. 2) Pump can run at high speed. 3) Saves power. 4) Reduces separation due to vapour pressure.	**Functions and advatages 2 marks**
	c)	**List the various gear pumps used in hydraulic circuit.** State the application of each gear pump.	**4**
	Ans	Gear pumps 1) External gear pump 2) Internal gear pump 3) Gerotor pump Applications of gear pump:	**List 2 marks; Applications**

		1) External Gear pump: An external precision gear pump is usually limited to a maximum working pressure of 210 bars (21,000 kPa) and a maximum speed of 3,000 rpm. a) Most commonly used for the hydraulic fluid power applications and are widely used in chemical installations to pump fluid with a certain viscosity. 2) internal gear pump applications are: All varieties of fuel oil and lube oil a) Resins and Polymers b) Alcohols and solvents c) Asphalt, Bitumen, and Tar d) Polyurethane foam (Isocyanate and polyol) e) Food products such as corn syrup, chocolate, and peanut butter f) Paint, inks, and pigments g) Soaps and surfactants h) Glycol 3) Gerotor Pump: common applications are as follows: A) Light fuel oils B) Lube oil C) Cooking oils D) Hydraulic fluid	**2marks**
	d)	**State two location of each, where seal and gasket are used in hydraulic system.**	**04**
	Ans	**(any two locations)** **Seals Location-** 1) Seal between piston and cylinder. 2) Seal between spool and direction control valve. 3) Seals for pump**.** **Gasket Location-** 1) Hydraulic oil tank cover and tank 2) Various connections of flanges and pipe 3) End covers and cylinders	**2 marks for seals;** **2marks for Gasket**
	e)	**State the necessity of direction control valve in hydraulic circuit? State how direction control valve is designed.**	**4**
	Ans	**Necessity of directional control Valve in hydraulic circuit:** In order to get desired movement of hydraulic actuator the fluid is supplied under pressure through direction control valve.The directional control valve must direct the flow from the pump either to port A or port B. The oil being exhausted by the cylinder must be directed from the other port back to tank. The number of ports (external connections) and the number of positions describe such valves. To perform the above function the directional control valve is necessary in hydraulic circuit. **Design of Direction control valve:** Direction control valve is designed to operate under normal operating conditions i.e. pressure , temperature, viscosity of fluid, flow rate of fluid through the valve, method	**Necessity - 2marks; Design- 2marks**

		of operating the valve etc. The direction control valve is designated by number of positions and number of ports connected in circuit. The design of Direction control valve also depends upon particular application. (Note: Due credit shall be given to appropriate answer.	
4.	**a)**	**Attempt any THREE of the following.**	**12**
	(i)	**Draw a neat labelled sketch of hydraulic jack. State the function of each component involved in hydraulic jack.**	**04**
	Ans	 **Figure Hydraulic Jack** **Function of components:** **1) Oil reservoir:** To store the oil and prevent it from contamination. Also to supply the oil a per requirement. **2) Hand Pump:** To pump the liquid from oil reservoir to big cylinder. 3) Big cylinder & piston : To act as jack to lift the car. The ratio of Area of big piston to area of pump piston is leverage required to reduce the manual effort.	**Sketch -2 marks; Functions – 2 marks**
	(ii)	**Give comparison between direct acting hydraulic lift and suspended type hydraulic lift.**	**04**
	Ans	**Comparison between direct acting hydraulic lift and suspended type hydraulic lift: (any 4 points- 1 mark each)**	**04**

Sl No.	Direct acting hydraulic lift	Suspended type hydraulic lift
1	It consists of a ram sliding in a cylinder.	It consists of a cage which is suspended from a wire rope.

		2	At the top of the ram a platform or cage is fitted on which the goods may be placed or the persons may be stand.	The cage is suspended from the other end of the rope. The load to be lifted is placed in a cage.	
		3	The liquid under pressure is admitted into the cylinder which pushes the ram vertically upwards thus raising the platform or the cage to the required height.	The water under pressure is admitted into the cylinder of the jigger. This water forces the sliding ram to move towards the left. This outward movement of the sliding ram makes the pulley block to move outward.	
		4	Less number of parts hence less maintenance.	More number of parts hence more maintenance.	
		5	More reliable.	Less Reliable.	
		6.	 Direct acting hydraulic lift.	 Suspended hydraulic lift.	
	(iii)	**Draw general layout of pneumatic system and label the components.**			**04**
	Ans	**General layout of pneumatic circuit**			**Layout – 03 marks ; labeling 1 mark**



02

(iv) **State the functions of filters and strainers used in hydraulic system and any two difference between filters and strainers.** **04**

Ans

Functions of Filter and strainers: **02**

1) To remove the impurities and other foreign matters from the oil.
2) Filter removes small particles (<40 micron) and strainer removes large particles (>40 micron)
3) To maintain system and components clean.
4) To increase the system reliability.
5) Filter is used to avoid blockage of small ports, flow area of pipes because of solid impurities present in the oil.

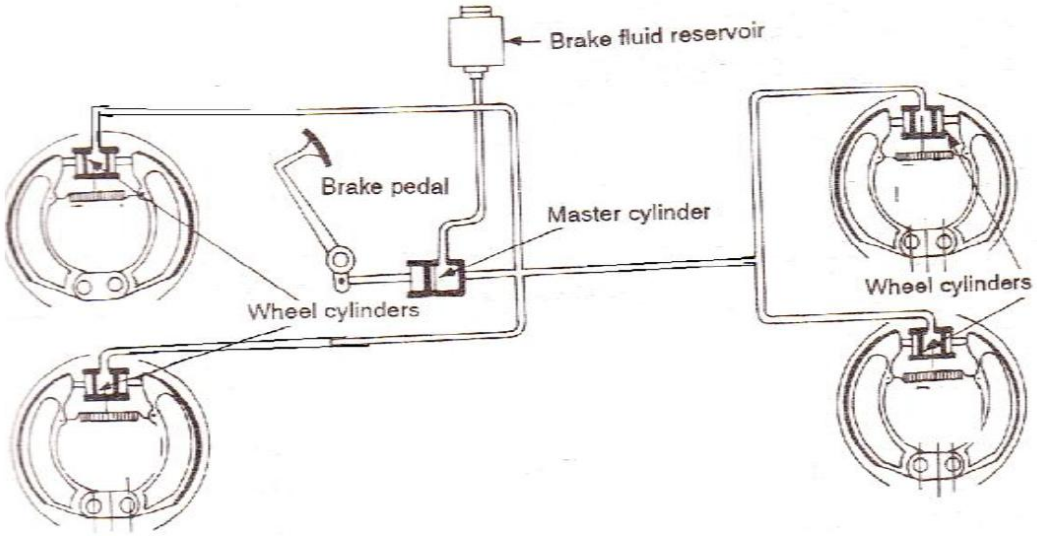
Difference between Filter & strainer: (Any 2 points) **02**

Sr.	Filters	Strainers
1	Filters remove particulates that are smaller than 40 microns	Strainers remove particulates that are larger than 40 microns.
2	If the particulate is too small to see with the naked eye the term "filter" is used.	Word "strainer" is typically used if the particulate being removed is visible to the naked eye
3	Filters have a screen that can be used once until it is clogged.	Strainer incorporates various screens which are reused.
4	If the screen is clogged, it must be changed. Filter screens are not re-used.	If the screen is clogged, it can be cleaned out and used again.
5	Filters are much more flow restrictive	Strainers are much less flow restrictive.
6	Filters are much better applied where positive pressure exists and where constant flow exists i.e. in return line	In most cases, strainers are connected in suction lines into a pump

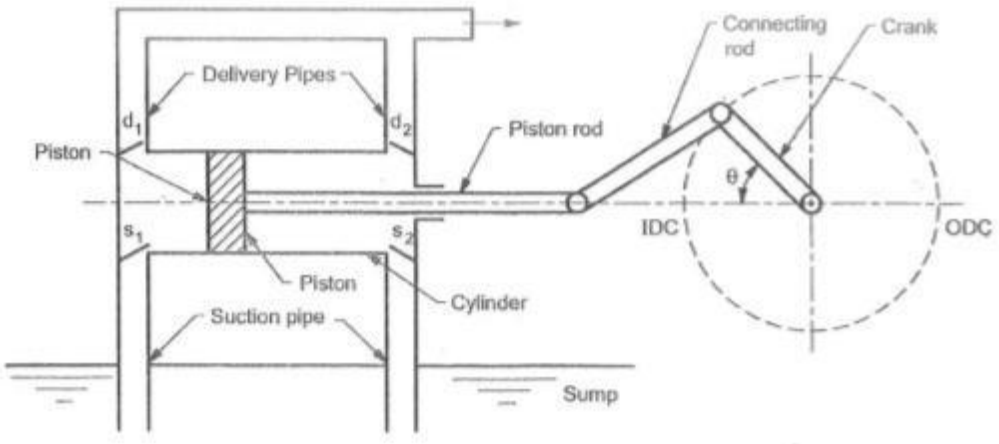
(v) **List the various hose and connectors used in pneumatic system.** **04**

	Ans	Hoses and connectors in pneumatic system: Hoses: - 1) Poly Urethane –PU tubing 2) PVC tubing 3) Nylon braided tubing 4) Metal wire braided rubber hose 5) Metal tubing Connectors: 1) Threaded elbow, tee, y-connectors 2) Push-in connectors 3) Reducer 4) Expanders 5) Plug. 6) Couplings	**Hoses 2 marks; Connectors-2 marks**
*4	b)	**Attempt any ONE of the following.**	6
	(i)	**Compare the pneumatic system and hydraulic system based on following parameters:** **1) Fluid used,** **2) Ease of operation,** **3) Noise,** **4) Speed,** **5) Cost,** **6) Application.**	**6**
	Ans	Comparison between hydraulic circuit and pneumatic circuit.	1 mark each

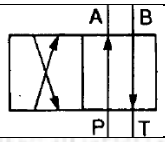
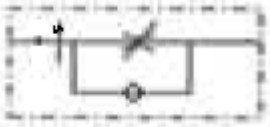
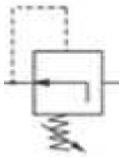
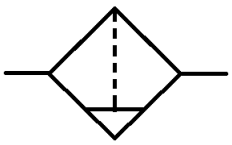
Sr. No	Basis	Hydraulic circuit	Pneumatic circuit
1	Fluid used	Hydraulic oil	Air
2	Ease of operation	Difficult to operate	Easy to operate
3	Noise	Low noise	Noisy operation
4	Speed	Speed is always limited.	very high speed is possible.
5	Cost	Moderate operating cost. High maintenance cost. Overall cost is moderate to high.	Low operating and maintenance cost. Overall cost is low.
6	Application	Hydraulic circuits are used in tackling heavy loads, hence used in earthmoving equipment, CNC-VMC machines.	Pneumatic circuits are used when loads are much lighter. Hence used in transferring the light weight components, vacuum handling in printing press, food industry.

	(ii)	**How the hydraulic circuit is utilized in hydraulic brake system? Explain with figure.**	**6**
	Ans	**Hydraulic circuit in hydraulic brake system:**  **Fig. Hydraulic brake system** **Working**: In hydraulic braking systems, the pressure applied at the brake pedal is transmitted to the brake mechanism by a liquid. Since a liquid cannot be compressed under ordinary pressures, force is transmitted solidly just as if rods were used. Force exerted at any point upon a confined liquid is distributed equally through the liquid in all directions so that all brakes are applied equally. In a hydraulic brake system, the force is applied to a piston in a master cylinder. The brake pedal operates the piston by linkage. Each wheel brake is provided with a cylinder. Inside the cylinder are opposed pistons which are connected to the brake shoes. When the brake pedal is pushed down, linkage moves the piston within the master cylinder, forcing the brake liquid or fluid from the cylinder. From the master cylinder, the fluid travels through tubing and flexible hose into the four wheel cylinders. The brake fluid enters the wheel cylinders between the opposed pistons. The pressure of the brake fluid on the pistons causes them to move out. This forces the brake shoes outward against the brake drum. As pressure on the pedal is increased, more hydraulic pressure is built up in the wheel cylinders and more force is exerted against the ends of the brake shoes. When the pressure on the pedal is released, retracting (return) springs on the brake shoes pull the shoes away from the drum. This forces the wheel cylinder pistons to their release positions and also forces the brake fluid back through the flexible hose and tubing to the master cylinder.	
5)		**Attempt any TWO of the following :**	**16**
	a)	**List any six types of flow. Define each type of flow. Give example of each flow.**	08
		Types of fluid flow- (any Six) 1. Steady flow,	

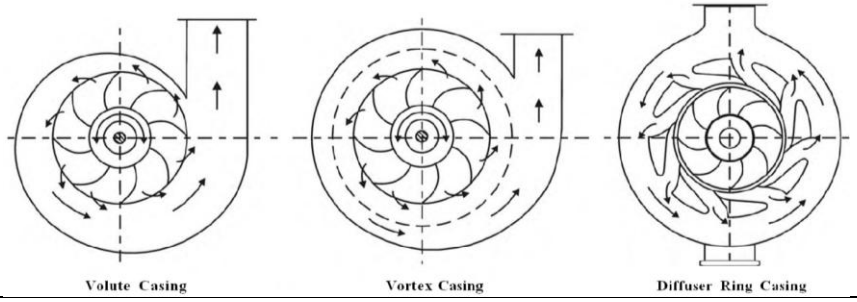
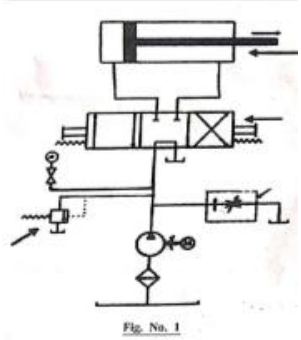
		2. Unsteady flow, 3. Uniform flow, 4. Non uniform flow, 5. Laminar flow, 6. Turbulent flow, 7. Compressible flow, 8. Incompressible flow, 9. Rotational flow, 10. Irrotational flow, 11. One dimensional flow, 12. Two dimensional flow, 13. Three dimensional flow, **Definition and example:** **1. Steady flow**-The flow in which liquid characteristics like velocity, pressure, and density do not change with time is known as steady flow. **Example**- i)Flow of liquid through pipe at constant rate. ii) Water flow out of tap which has not just been opened. **2. Unsteady flow**- The flow in which liquid characteristics like velocity, pressure, and density changes with time is known as unsteady flow. **Example**- i)Flow of liquid through pipe at varied rate. ii) Water flow out of tap which has just been opened. **3. Uniform flow**- The flow in which velocity at any given time does not change with length of flow is known as uniform flow. **Example**- i)Flow of liquid through a duct of constant c/s. **4. Non uniform flow**- The flow in which velocity at any given time changes with length of flow is known as nonuniform flow. **Example**- i)Flow of liquid through a duct of varying c/s. **5. Laminar flow**-The flow in which fluid particles moves in well defined path and does not cross each other is known as laminar flow. **Example**- i)Smoke from cigarette before swirling and mixing with atmospheric air. ii) Water or oil flow through thin tube with low speed. **6. Turbulent flow**- The flow in which fluid particles moves in zig-zag way and crosses each other is known as turbulent flow. **Example**- i)Smoke from cigarette after swirling and mixing with atmospheric air. ii) Water or oil flow through thin tube with high speed. iii) Flow of water from leakage pipe line, during flood conditions. **7. Compressible flow**- The flow in which density is not constant is known as compressible flow. **Example**- i)Flow of air through varying c/s. **8. Incompressible flow**- The flow in which density is constant is known as incompressible flow. **Example**- i)Flow of fluid through varying c/s. **9. Rotational flow**- The flow in which fluid particles rotate about its own axis while flowing is known as rotational flow	**List 2 Marks ;** **Definition and example 1 mark for 1 type of flow**

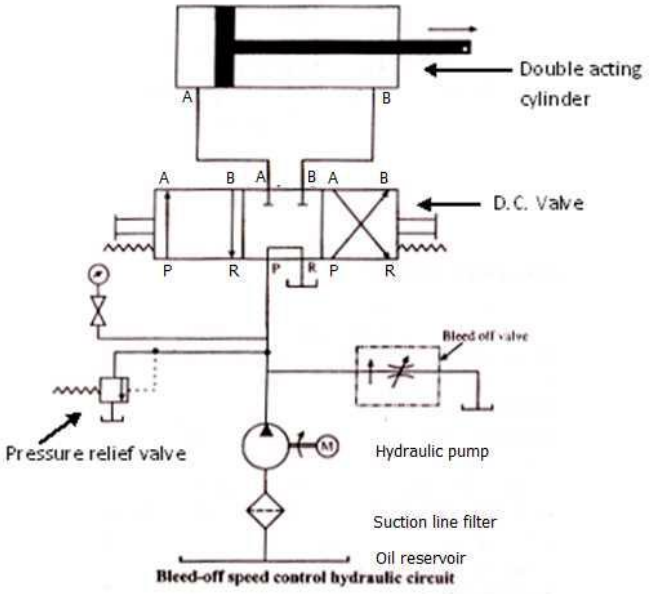
		Example- i)Flow of rain fall. 2. Flow of water in wash basin. **10. Irrotational flow**- The flow in which fluid particles does not rotate about its own axis while flowing is known as irrotational flow **Example**- i)Flow of water in open channel. **11. One dimensional flow**- The flow which posses streamlines along one direction only is known as one dimensional flow. **Example**- i)Flow in a pipe. **12. Two dimensional flow**- The flow which posses streamlines along any two mutually perpendicular directions is known as two dimensional flow. **Example**- i)Flow over a weir. **13. Three dimensional flow**- The flow which posses streamlines along any three mutually perpendicular directions is known as two dimensional flow. **Example**- i)Flow over a weir.	
	b)	**Explain principle construction and working of double acting reciprocating pump.**	**08**
		Double acting reciprocating pump: **Working Principle:** In reciprocating air compressor, as the piston moves towards the BDC, the air is sucked into the cylinder from the atmosphere and when it moves towards the TDC, the compression of the air starts and keeps on going and pressure increases. **Construction:** Figure shows a double acting reciprocating pump, which consist of a piston which moves forwards and backwards in a close fitting cylinder. The movement of the piston is obtained by connecting the piston rod to crank by means of connecting rod. The crank is rotated by means of an electric motor. Suction and delivery pipe with suction valve and delivery valve are connected to the cylinder .The suction and delivery valves are one way valves or non return valves, which allow the water flow in one direction only. Suction valve allows water from suction pipe to the cylinder which delivery valve allows water from cylinder to delivery pipe only.  **Figure: Double acting reciprocating pump**	Principle-2mark, construction 2 marks; sketch 2 mark, working 2 marks

		Working: This type of pump operates in exactly the same way as the single acting with respect to its action. The difference is, that the cylinder has inlet and outlet ports at each end of the cylinder. As the piston moves forward, liquid is being drawn into the cylinder at the back end while, at the front end, liquid is being discharged. When the piston direction is reversed, the sequence is reversed. With a double acting pump, the output pulsation is much less than the single acting.	
	c)	**Sketch the symbols of following components used in pneumatic and hydraulic circuit:** **(i) 4/2 Direction control Valve** **(ii) Pressure compensated flow control valve with integral check valve.** **(iii) Pressure reducing valve.** **(iv) Fitter with separator.**	**08**

Sl no	Component	Symbol
(i)	**4/2 Direction control Valve**	
(ii)	**Pressure compensated flow control valve with integral check valve.**	
(iii)	**Pressure reducing valve.**	
(iv)	**Fitter with separator.**	

6.		**Attempt any TWO of the following:**	**16**
	a)	A venturimeter has its axis vertical the inlet and throat diameter being 150mm and 75 mm respectively. The throat is 225 mm above inlet and co-efficient of discharge is 0.96. petrol of specific growing 0.78 flows up through the meter at a rate of 0.029 m^3/s. Find the pressure difference between inlet and the throat.	08
		The discharge through a venturimeter is given by $Q= \frac{Cd*a1*a2*\sqrt{2*g*h}}{\sqrt{a1^2-a2^2}}$ Given: Cd = 0.96, d1 =150mm= 0.015m, d2 =75mm= 0.0075m, a1 =(π/4)*0.0152 =0.0177m^2 a2 =(π/4)*0.00752 =0.0044m^2 Q = 0.029 m^3/sec By substitution, we have $0.029=\frac{0.96*0.0177*0.0044*\sqrt{2*9.81*h}}{\sqrt{0.0177^2-0.0044^2}}$	Formula of Q 01 mark Calculation a1&a2 02 mark

		h= 2.254m of petrol h= (p1/w+z1) - (p2/w + z2) 2.254= [(p1/w)- (p2/w)]-[z2-z1] 2.254= [(p1/w)- (p2/w)]-[0.225] p1/ρg - p2/ρg =2.479 Therefore, p1 - p2= 2.479*0.78*9810 = 18969 N/m2 =18.969k N/m2 =18969 Pa Pr. Difference, p1 - p2 = 18.96 kPa	Calculation of h petrol 02 mark; Formula for h 01 mark Calculation 2 mark
	b)	**Explain with neat sketch different casing used in centrifugal pump.**	08
		Different casing used in centrifugal pump: **1) Volute casing:** A volute is a curved funnel that increases in area as it approaches the discharge port. The volute of a centrifugal pump is the casing that receives the fluid being pumped by the impeller, maintaining the velocity of the fluid through to the diffuser. This is a spiral shaped whose area of cross-section gradually increases towards the delivery pipe. **2) Vortex casing:** When a circular chamber is introduced between the impeller and casing, the casing is known as vortex casing. 3) **Diffuser ring casing:** after the fluid has left the impeller, it is passed through a ring of fixed vanes that diffuse the liquid, providing a more controlled flow and a more efficient conversion of velocity head into pressure head.  Volute Casing Vortex Casing Diffuser Ring Casing	Sketch 4marks ; explanation- 4marks
	c)	Identify the following circuit in fig. No. 1. Label it and explain its working. State its application  Fig. No. 1	08

		The given circuit is Bleed-off hydraulic circuit:  Bleed-off speed control hydraulic circuit **Working :** Bleed off circuit does not control the flow going to actuator or flow returning from the actuator. It controls diverted part of the fluid to control the flow. In this circuit Flow control valve are placed in the bypass line. In this circuit neither incoming nor outgoing flow is metered. In this method pressurized fluid coming out of pump is diverted and bypassed to oil reservoir. This circuit is used for controlling linear speed of piston in double acting cylinder. Here speed of piston is depends on difference between pump delivery flow and flow being by passed to tank through flow control valve. **Applications :** 1. broaching machine 2. shaping machine 3. planing machine 4. hydraulic motor brake circuit 5. Concrete mixer on truck	Identification of circuit 02 mark; Draw Circuit 2 marks ; Working-2 marks ; Applications-2 marks