

**5<sup>TH</sup> SEM./ DIP.MECH/ MECH(MAIN)/ MECH(PROD) /MECH(SAND)  
/MECH /MECH (IND.INT) /MECH(AUTO)/ 2020(W) NEW  
Th3-Hydraulic Machines & Industrial Fluid Power**

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1 & 2  
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
  - a. Write down the definition of hydraulic turbine and give one example.
  - b. What is the mathematical formula for hydraulic efficiency of Francis turbine?
  - c. Write the formula for speed ratio of Kaplan turbine.
  - d. Define about suction lift and delivery lift for centrifugal pump.
  - e. Define about hydraulic pump.
  - f. Define positive slip and negative slip for reciprocating hydraulic pump.
  - g. Why air regulator is used in the pneumatic control system?
  - h. What is the function of flow control valve in pneumatics?
  - i. Write the purpose of using actuators in hydraulic control system.
  - j. Draw symbols for bi-directional motor and check valve of hydraulic control.
2. Answer **Any Six** Questions 6 x 5
  - a. Distinguish between impulse and reaction turbine.
  - b. Write a short note about working of centrifugal hydraulic pump.
  - c. A single acting reciprocating pump running at 100 rpm delivers  $0.012 \text{ m}^3/\text{sec}$  of water. The diameter and stroke of the cylinder are 0.2 m and 0.3 m respectively. Calculate the coefficient of discharge and percentage of slip.
  - d. Explain briefly about air lubricator.
  - e. Write down short note on single-acting cylinder for pneumatic control.
  - f. Write about the advantages and limitations of hydraulic system.
  - g. Write briefly about direct acting relief valve.
3. The mean bucket speed of a pelton wheel is 10 m/s. Jet of water flows at the rate of  $0.8 \text{ m}^3/\text{sec}$  under a head of 35m. The buckets deflect the jet through an angle of  $165^\circ$ . If the coefficient of velocity of the jet is 0.98, then find power developed by water in the turbine and hydraulic efficiency of turbine. 10
4. Find the manometric efficiency and vane angle at inlet of a centrifugal pump delivering water at the rate of  $0.2 \text{ m}^3/\text{s}$  against a total head of 80m. The pump runs at 1450 rpm. The inner and outer diameter of the pump are 25 cm and 50 cm respectively. The area of flow through the impeller is  $0.08 \text{ m}^2$ . The vanes are curved in backward direction at an angle of  $30^\circ$  at exit. 10
5. Explain in detail about construction and working of double acting reciprocating pump with neat sketch. 10
6. Explain in detail about 3/2 DCV and 5/2 DCV with proper diagrams for pneumatic control systems. 10
7. Explain about external and internal gear pumps used in hydraulic controls. 10

V-SEM./MECH/DIP IN MECH/MECH(PROD)/MECH(MAINT)/  
 MECH(IND INTG) /MECH(SWITCH)/ 2021(W)  
 TH-III Hydraulic Machines and Industrial Fluid Power

Time- 3 Hrs

Full Marks: 80

Answer any five Questions including Q No.1 & 2  
 Figures in the right hand margin indicates marks

2 x 10

1. Answer **All** questions
  - a. Define hydraulic machines.
  - b. What is slip in pump?
  - c. What is actuator?
  - d. Draw symbols for the following hydraulic components.
    - I. Pressure relief valve.
    - II. Double acting cylinder.
  - e. Why and where filters are fitted in a hydraulic circuit?
  - f. Classify the turbines in terms of head of water available.
  - g. Write the expression for power required to drive a double-acting reciprocating pump.
  - h. Why air is preferred as the working medium in pneumatic pump.
  - i. Write the functions of throttle valves?
  - j. What are the functions of pressure control valves?
2. Answer **Any Six** Questions
  - a. Give the comparison between impulse turbine and reaction turbine.
  - b. Explain the working of an external gear pump.
  - c. A single acting reciprocating pump running at 50r.p.m. delivers  $0.00736\text{m}^3/\text{sec}$  of water. The diameter of the piston is 200mm and stroke length 300mm. The suction and delivery heads are 3.5m and 11.5m respectively. Determine
    - I. Theoretical discharge.
    - II. Co-efficient of discharge.
    - III. Percentage slip of the pump.
  - d. A pelton wheel having a mean bucket diameter of 1.2m is running at 1000r.p.m. The net head on the pelton wheel is 840m. If the side clearance angle is  $15^\circ$  and discharge through the nozzle is  $0.12\text{m}^3/\text{sec}$ . Determine.
    - I. Power available at the nozzle and
    - II. Hydraulic efficiency of the turbine.
  - e. Write a suitable diagram explain main parts of a Kaplan turbine.
  - f. Write advantages and disadvantages of Francis turbine over a pelton wheel.
  - g. Give the comparison between hydraulics and pneumatics drive systems.
3. What is directional control valve? Explain the working of 3/2 and 5/3 directional control valve. 10
4. Explain the working of single acting reciprocating pump. 10
5. Describe various efficiencies of a turbine. 10
6. A kalpan turbine develops 24647.6kw power at an average head of 39 meters. Assuming a speed ratio of 2. flow ratio of 0.6 diameter of the boss equal to 0.35 times the diameter of the runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine. 10
7. A centrifugal pump is to discharge  $0.118\text{m}^3/\text{sec}$  at a speed of 1450rpm against a head of 25m. The impeller diameter is 250mm, its width at outlet is 50mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. 10