* 6447 *

C16–M–402

# 6447

## BOARD DIPLOMA EXAMINATION, (C–16)

## MARCH/APRIL—2018

## DME—FOURTH SEMESTER EXAMINATION

HYDRAULICS AND FLUID POWER CONTROL SYSTEMS

*Time* : 3 hours ] [ *Total Marks* : 80

**PART—A** 3×10=30

***Instructions*** : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

**1.** At particular point inside the fluid gauge pressure is 2 bar and atmospheric pressure is 1·01325 bar. Determine the absolute pressure of the fluid. 3

**2.** State the continuity equation and write the mathematical expression of it. 3

**3.** Mention the various losses in pipe flow. 3

**4.** Derive an expression for the normal force exerted by a water jet on a moving flat plate. 3

**5.** Define terms used in hydraulic turbines *(a)* hydraulic efficiency and *(b)* overall efficiency. 1½+1½=3

**6.** Write any four differences between reciprocating pump and centrifugal pump. 3

**7.** List out basic elements of hydraulic circuit. 3

**8.** State the functions of flow control valve and pressure control valve. 3

**9.** Write the applications of pneumatic power. 3

**10.** State the functions of lubricator and air filter in a pneumatic system. 1½+1½=3

## PART—B

10×5=50

***Instructions*** : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

**11.** Explain the simple U-tube manometer with the help of neat sketch. Also derive an expression for measuring gauge pressure. 10

**12.** *(a)* The diameters of a tapered pipe at two different sections are 15 cm and 20 cm respectively. What is the discharge through the pipe if the velocity of liquid at bigger section is 4 m/s. Also calculate the velocity at smaller section.

*(b)* State the Bernoulli's equation and write the mathematical expression for it. 5+5=10

**13.** Find the maximum power transmitted that can be transmitted to power station through hydraulic pipe 3 km long and 20 cm diameter, when the pressure at the power station is 600 kN/m$^2$. Take $f$ = 0·0075. 10

**14.** A jet of water 20 mm in diameter, moving with a velocity of 10 m/s, strikes on a series of vanes moving with a velocity of 3 m/s. Find—

*(a)* force exerted by jet;

*(b)* work done per second;

*(c)* efficiency of the jet. 4+3+3=10

**15.** A pelton wheel operates under a head of 600 m, out of which one third is lost in friction in the penstock. Mean diameter of wheel is 3·5 m and runs at 200 RPM. Bucket angle at outlet is 15°. Discharge is 100 lit/sec. The coefficient of velocity ($C_V$) is 0·98. Determine—

*(a)* the power developed by the runner;

*(b)* hydraulic efficiency of the turbine. 6+4=10

**16.** A single acting single cylinder reciprocating pump operating at 120 RPM has a piston diameter of 200 mm and stroke of 300 mm. The suction head and delivery head are 4 m and 20 m respectively. Determine—

*(a)* theoretical discharge;

*(b)* theoretical power required to drive the pump;

*(c)* slip, if actual discharge is 0·02 $m^3/s$. 5+3+2=10

**17.** Explain the working of following pumps with neat sketches : 5+5=10

*(a)* Internal gear pump

*(b)* Vane pump

**18.** What are essential elements of pneumatic circuits? State their functions with the help of neat sketch. 10

★ ★ ★