

**21052**                      Seat No. \_\_\_\_\_  
**Second Year B. Sc. Examination**  
April/May – 2003  
**Hydraulics & Pumps**

Time : 3 Hours]

[Total Marks : 70

- Instructions :** (1) All questions are **compulsory**.  
(2) Figures to the **right** indicate **full** marks.  
(3) Draw neat sketch wherever necessary.  
(4) Assume suitable additional data, if necessary.

- 1 (a) Explain the important properties of water and explain 8  
them in details.  
(b) State the advantages of V-notch over Rectangular 6  
notch.

**OR**

- 1 (a) Define following terms : 8  
(1) Absolute pressure  
(2) Gauge pressure  
(3) NFF  
(4) BTU.  
(b) Derive the expression for discharge over triangular 6  
notch.
- 2 (a) Derive the Bernaulli's equation and state it's 8  
assumptions.  
(b) A pipe through which water is flowing having 6  
diameter 20 cm and 10 cm at cross section 1 and 2  
respectively. Velocity at cross section 1 is 4 m/s, find  
the velocity head at section 1 and 2 and also find the  
rate of discharge.

**OR**

- 2 (a) Distinguish between manometer and mechanical gauge. 6  
What are the different types of mechanical pressure gauge ?
- (b) Define the following terms : 8
- (1) Steady flow
  - (2) Non uniform flow
  - (3) Laminar flow
  - (4) Two Dimensional flow.
- 3 (a) Explain "flow through parallel pipes" 4
- (b) A pipeline of 0.6 m diameter is 1.5 km long. 4  
To increase the discharge, another line of the same diameter is introduced parallel to the first in the second half of the length. Neglecting minor losses, find the increase in discharge if  $4f = 0.04$ . The head of inlet is 300 mm.
- (c) Define the following terms : 4
- (1) H.G.L.
  - (2) T.F.L.

**OR**

- 3 (a) Explain "flow through compound pipe" 4
- (b) Derive the expression for head loss in a sudden enlargement of a pipe. 7
- (c) Explain the phenomenon of water hammer. 3
- 4 (a) With neat sketch show that the force exerted by a jet of water on an inclined fixed plate in the direction of the jet is given by : 8

$$f_x = \rho a v^2 \sin^2 \theta$$

where  $a$  = Area of jet

$v$  = Velocity of jet

$\theta$  = Inclination of plate with the jet.

- (b) Water is flowing through a pipe at the end of which a nozzle is fitted. The diameter of the nozzle is 100 mm. and the head of the water at the centre of nozzle is 100 mm. Find the force exerted by the jet of water on a fixed vertical plate. The coefficient of velocity is given as 0.95. 4
- (c) What is impact of jet ? 2

**OR**

- 4 (a) Show that the angle of swing of a vertical hinged plate is given by  $\sin\theta = \rho av^2/w$  7
- where  $v$  = velocity of the jet striking the plate  
 $a$  = area of the jet  
 $w$  = weight of the plate.

- (b) Derive the expression for the force exerted by a jet on moving plates. 7

- 5 (a) Explain the construction and working of centrifugal pump. 8
- (b) Explain the requirement of priming and method of priming 6

**OR**

- 5 (a) Explain the specification of centrifugal pump. 8
- (b) Describe the "centrifugal pump efficiency". 6

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