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C20-C-303

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BOARD DIPLOMA EXAMINATION, (C-20)
JUNE/JULY—2022

DCE - THIRD SEMESTER EXAMINATION

HYDRAULICS

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. Define mass density and capillarity.
2. Define total pressure and centre of pressure.
3. State Bernoulli's theorem.
4. List the any three types of mouthpieces with respect to position.
5. Write the formula for discharge through a right angled triangular notch.
6. A rectangular notch has a discharge $21.5 \text{ m}^3/\text{min}$, when the head of water is half the length of the notch; find the length of the notch. Assume $C_d = 0.6$.
7. List any three losses that occur in pipe flow.
8. Define most economical section in open channel flow.
9. List any three types of pumps.
10. List any three functions of surge tank.

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PART—B

8×5=40

Instructions : (1) Answer all questions.

(2) Each question carries eight marks.

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

11. (a) A U-tube differential manometer consists of two pressure pipes A and B. pipe A contains carbon tetrachloride having a specific gravity 1.594 under a pressure of 11.772 N/cm² and pipe B contains oil of Sp. gravity 0.8 under a pressure of 11.772 N/cm². The pipe A lies 2.5 m above pipe B. Find the difference of pressure measured by mercury as filling fluid in U-tube.

(OR)

- (b) A vertical sluice gate is used to cover an opening in a dam. The opening is 2 m wide and 1.2 m high. On the upstream of the gate the liquid of sp. gravity 1.45 lies up to a height of 1.5 m above the top of the gate, whereas on the downstream side the water available up to a height touching the top of gate. Find the resultant force acting on gate and position of centre of pressure.

12. (a) A circular tank of diameter 1.25 m contains water up to a height of 5 m. An orifice of 50 mm diameter is provided its bottom if $C_d = 0.62$. Find the height of water above the orifice after 2.5 minutes.

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(OR)

- (b) An external cylindrical mouthpiece of diameter 100 mm is discharging water under a constant head of 8 m. Determine discharge and absolute pressure head of water at vena-contracta. Take $C_d = 0.855$ and C_c of vena-contracta = 0.62. Take atmospheric pressure head = 10.3 m of water.

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13. (a) A rectangular notch of crest width 0.4 m is used to measure the flow of water in rectangular channel 0.6 m wide and 0.45 m deep. If water level in the channel is 0.225 m above the crest, find the discharge in the channel. For the notch assume $C_d = 0.63$ and velocity of approach into account.

(OR)

- (b) Water flows over a rectangular notch of 1 m length over a depth of 15 cm. When the same quantity of water passes through a right angled triangular notch, find the depth of the water through the notch. Take coefficient of discharge for rectangular notch and triangular notches as 0.62 and 0.59 respectively.

14. (a) Three pipes of lengths 800 m, 600 m and 300 m and of diameters 400 mm, 300 mm, 200 mm respectively connected in series. The ends of the compound pipe are connected to two tanks, whose water levels difference is 15 m. Determine the rate of flow of water through the pipes if $f = 0.05$. What will be diameter of single pipe of length 1700 m and $f = 0.005$, which replaces the three pipes?

(OR)

- (b) Two reservoirs are connected by a pipe line 22 m long consisting of two pipes one of 15 cm dia. and length 6 m and the other of dia. 22.5 cm and 16 m length. If the difference of water levels in two reservoirs is 6 m, calculate the discharge.

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15. (a) A rectangular channel carries water at the rate of 400 lit/sec when bed slope is 1 in 2000. Find the most economical dimensions of the channel, if Manning's constant $n = 0.012$.

(OR)

- (b) A trapezoidal channel, carrying water has bottom width of 4 m and side slopes of 1 horizontal to 2 vertical. If the bed slope of the channel is 1 in 500, find the discharge through the channel. Assume Manning's $n = 0.03$ in Manning's formula, if depth of flow is 3.2 m.

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PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) The question carries ten marks.

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

16. A town having a population of 200000 is to be supplied with water from a reservoir at 5 km distance. If one half of the daily supply of 150 litres per head should be delivered within 8 hours, what must be the size of the pipe, if the head available is 12 m? Take, $C = 45$ in Chezy's formula.

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