

December 2017

HYDRAULICS (FOR CE)

Time Allowed: 3 Hours

Full Marks: 70

**Answer to Question No.1 is compulsory and to be answered first.
This answer is to be made in separate loose script(s) provided for the purpose.
Maximum time allowed is 45 minutes, after which the loose answer scripts will be collected and
fresh answer scripts for answering the remaining part of the question will be provided.
On early submission of answer scripts of Question No.1,
a student will get the remaining script earlier.
Answer any five questions from the rest.**

1. A. Choose the correct one from the alternatives given: 1x10
- i) Ideal fluid is one which is – a) Compressible, possess viscosity & surface tension, b) Incompressible and has no viscosity & surface tension, c) Compressible and has no viscosity & surface tension, d) All of the above.
 - ii) Kinematic viscosity is defined as equal to – a) dynamic viscosity / density, b) pressure × density, c) dynamic viscosity × density, d) dynamic viscosity × pressure.
 - iii) Which of the following is dimensionless? – a) Specific speed, b) Specific volume, c) Specific gravity, d) Specific weight.
 - iv) The angle of contact for a liquid which was the sides of the glass tube is – a) 0°, b) less than 90°, c) greater than 90°, d) equal to 90°.
 - v) The centre of pressure always acts _____ the centre of gravity of the immersed surface – a) above, b) at, c) below, d) can't say.
 - vi) Manometer is suitable for measuring – a) only low pressure, b) only high pressure, c) both high and low pressure, d) only negative pressure.
 - vii) Continuity equation deals with the law of conservation of – a) mass, b) energy, c) momentum, d) none of the above.
 - viii) The path followed by a fluid particle in motion is called a – a) stream line, b) streak line, c) path line, d) none of the above.
 - ix) Cippolett's weir is a trapezoidal weir having side slopes of – a) 1:4, b) 1:5, c) 2:3, d) 1:2.
 - x) For pipes connected in parallel – a) $h_f = h_1 + h_2 + \dots$, b) $f = f_1 + f_2 + \dots$, c) $v = v_1 + v_2 + \dots$, d) $Q = Q_1 + Q_2 + \dots$
 - xi) The discharge in an open channel corresponding to the critical depth is – a) Maximum, b) zero, c) Minimum, d) None.
 - xii) Sub critical flow is also called – a) Streaming Flow, b) Tranquil Flow, c) Shooting Flow, d) Both a & b.
 - xiii) The depth after hydraulic jump is called – a) Initial depth, b) Sequent depth, c) Alternate depth, d) All of these.
 - xiv) Loss of head at the entrance of a pipe – a) $v^2/2g$, b) $0.5 v^2/2g$, c) $k v^2/2g$, d) None of these.

https://www.wbscteonline.com

https://www.wbscteonline.com

- xv) Priming is done in order to – a) run the pump satisfactorily, b) remove air from impeller and casing, c) completely fill the impeller and casing, d) all of the above.

1x10

B. Answer the questions (any ten):

- i) Reciprocating pump is a type of _____ pump.
- ii) Pelton wheel is a _____ of turbine.
- iii) In a most economical trapezoidal channel section, half of the top width = _____.
- iv) A channel is said to be prismatic channel if the cross section and bed slope do not change along the _____ of the channel.
- v) In a laminar flow, Reynold's number is _____.
- vi) The highest point in a pipe lying above the hydraulic gradient line is called _____.
- vii) Area velocity method is used for measurement of _____ of a river at a point.
- viii) The flow in which fluid particles move in zigzag path is called _____ flow.
- ix) All pressure gauges when open to atmosphere gives reading _____.
- x) A _____ is a short length of pipe fitted in a tank containing the fluid.
- xi) The point where total pressure acts is known as _____.
- xii) _____ is that branch of hydraulics which deals with water at rest.
- xiii) The ratio of actual velocity of jet at vena-contracta to the theoretical velocity is called ____.
- xiv) The reciprocal of mass density is known as _____.
- xv) The phenomenon of rise or fall of a liquid in a thin tube relative to the adjacent general level of liquid is known as _____.

2. a) Define Newton's Law of viscosity.
b) If the specific gravity of petrol is 0.70, calculate its density, specific volume, specific weight.
c) A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of sp.gr.0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40 cm. and the height of fluid in the left from the centre of pipe is 15 cm below. 2+3+5
3. a) Define total pressure and centre of pressure.
b) A tank contains water up to a height of 0.5 m above the base. An immiscible liquid of sp.gr.0.8 is filled on the top of water up to 1m height, calculate – (i) Total pressure on one side of the tank, (ii) the position of C.P. for one side of the tank which is 2m wide. 3+7
4. a) State the Bernoulli's theorem.
b) What are the assumption and limitation of Bernoulli's theorem?
c) A pipe of diameter 200 mm conveys a discharge of 2250 litres of water per minute and has a pressure of 15.70 KPa at a certain section. Find the total energy head with respect to a datum of 5 metre below the pipe. <https://www.wbsctonline.com> 1+2+2+5
5. a) What is Hydraulic Gradient Line and Total Energy Line?
b) The rate of flow of water through a horizontal pipe is $0.3 \text{ m}^3/\text{s}$. The diameter of the pipe is suddenly enlarged from 250 mm to 500 mm. The pressure intensity in the smaller pipe is 13.734 N/cm^2 . Determine – (i) Loss of head due to sudden enlargement (ii) Pressure intensity in the large pipe. 3+7
6. a) Define sub critical, critical and super critical flow.
b) Three pipes of lengths 800m, 600m, and 300m and the diameter of 400mm, 300mm, and 200mm respectively, are connected in series. The ends of the compound pipe is connected to two tanks, whose water surface levels are maintained at a difference of 15 m. Determine the rate of flow of water through pipes if $f=0.005$. What will be the diameter of a single pipe of length 1700m and $f=0.005$, which replaces the three pipes. 3+7
7. a) Define hydraulic jump with expression for depth.
b) What are the uses of hydraulic jump?
c) A trapezoidal channel has side slopes of 3(H) to 4(V) and slope of its bed is 1 in 2000. Determine the optimum dimensions of the channel, if it is carry water at $0.5 \text{ m}^3/\text{s}$. Take Chazy's constant as 80. 3+3+4

8. a) Define any two – (i) Notch, (ii) Weir, (iii) Venturiflume.
b) Define coefficient of velocity (C_v) coefficient of contraction (C_c), coefficient of discharge (C_d).
c) Water flows through a triangular right angled weir first and then over a rectangular weir of 1 m width. The discharge co-efficient of the triangular and rectangular weirs are 0.6 and 0.7 respectively. If the depth of water over the triangular weir is 36 cm, find the depth of water over the rectangular weir. 2+3+5
9. a) Define – (i) centrifugal pump, (ii) venturimeter, (iii) Orifice.
b) Describe briefly with neat sketches different parts of a centrifugal pump.
c) What is velocity approach? Write down the formula for actual discharge of venturimeter. 3+4+2+1
10. a) Define any three – (i) specific energy, (ii) alternate depth, (iii) critical depth, (iv) Minimum specific energy, (v) critical velocity
b) A pitot static tube placed in the centre of a 30 cm pipe line has one orifice pointing upstream and other perpendicular to it. The mean velocity in the pipe is 0.80 of the central velocity. Find the discharge through the pipe if the pressure difference between the two orifices is 6 cm of water. Take $C_v = 0.98$. (3x2)+4
11. a) Define Absolute Pressure, Gauge Pressure and Vacuum Pressure with diagram.
b) What are the minor losses of pipe? What is friction factor?
c) A rectangular sluice gate is situated on the vertical plane of a lock. The vertical side of the sluice is 'd' meters in length and depth of centroid of the area is 'p' meters below the water surface. Prove that depth of pressure is equal to $(p+d^2 / 12p)$. 3+2+1+4

<https://www.wbsctonline.com>

Whatsapp @ 9300930012

Send your old paper & get 10/-

अपने पुराने पेपर्स भेजे और 10 रुपये पायें,

Paytm or Google Pay से