KATHMANDU UNIVERSITY
End Semester Examination[C]
June 2018

Mark Scored:

Level : B.E.
Year : III

Course : CIEG 301
Semester : I

Exam Roll No.:

Time: 30 mins.

F. M. : 10

Registration No.:

Date JUN 19 2018

SECTION "A"
[20Q. × 0.5 = 10 marks]

Tick (√) the most appropriate answer.

1. The property by virtue of which a liquid opposes relative motion between different layers is
   a. Surface tension b. Coefficient of viscosity c. Viscosity d. Osmosis

2. Steady flow occurs when
   a. The direction and magnitude of the velocity at all points are identical
   b. The velocity of successive fluid particles, at any point, is the same at successive Periods of time
   c. The magnitude and direction of the velocity do not change from point to point in the fluid
   d. The fluid particles move in plan or parallel planes and the streamline patterns are identical in each plane

3. The formation of channel bed due to flowing liquid is called .....
   a. Bed load b. Wash load c. Suspended load d. Bed forms

4. Most economical section of a circular channel for maximum discharge
   a. Depth of water = 0.95 diameter of circular section
   b. Hydraulic mean depth = 0.286 diameter of circular section
   c. Wetted perimeter = 2.6 diameter of circular section
   d. Wetted perimeter = 2.83 depth of water

5. Dynamic similarity between the model and the prototype is the
   a. Similarity of motion b. Similarity of lengths
   c. Similarity of forces d. Similarity of discharge

6. Unit of kinematic viscosity is
   a. m^2/sec b. Newton sec/m^2 c. Newton sec/m^3 d. $Kg.sec/m^2$

7. Critical depth of (y_c) of channel is
   a. $y_c = v^2/g$ b. $y_c = v^2/2g$ c. $y_c = v/2g$ d. $y_c = v/g$

8. The phenomenon occurring in an open channel when a rapidly flowing stream abruptly changes to a slowly flowing stream causing a distinct rise of liquid is
   a. Water hammer b. Hydraulic jump c. Critical discharge d. Afflux

9. A pipe consisting of several pipes of varying diameters and lengths, may be replaced by an equivalent pipe of
   a. $L = d^4 (L_1/d_1^4 + L_2/d_1^4 + L_3/d_1^4 \ldots)$
   b. $L = d^3 (L_1/d_1^3 + L_2/d_1^3 + L_3/d_1^3 \ldots)$
   c. $L = d^5 (L_1/d_1^5 + L_2/d_1^5 + L_3/d_1^5 \ldots\ldots)$
   d. $L = d^2 (L_1/d_1^2 + L_2/d_1^2 + L_3/d_1^2 \ldots\ldots)$

10. The ratio of inertia and gravitational force acting in any flow, ignoring other forces is called
   a. Euler number b. Froude number c. Reynold number d. Weber number

11. In pipe lines, a Surge tank is provided
   a. To relieve the pressure due to water hammer
   b. To provide additional water head
   c. To overflow the pipe line when suddenly closed
   d. To remove the frictional loss in pipe

12. Hydraulic gradient is equal to difference in water surfaces
   a. Differences in water surfaces/ total length of the channel
   b. Head loss due to friction /total length of the channel
   c. Wetted perimeter/ total length of the channel
   d. Area of the cross section/ total length of the channel

13. The valve of closure is said to be sudden if
   a. $T < L/c$ b. $T < 2L/c$ c. $T < 3L/c$ d. $T < 5L/c$

14. The length of pipe is L, velocity of flow of a liquid in the pipe is V, If t is the time in second required to close the valve, the head of pressure
   a. $H = LV/ g.t$ b. $H = L.t/ V.g$ c. $H = L .V^2/ g.t$ d. $H = V^2.t/ L.g$

15. For a critical depth of flow of water in open channels, E the specific energy must be
   a. Minimum b. Maximum
   c. Average of maximum and minimum d. Twice the hydraulic radius

16. For most economical rectangular section of a channel, the depth is
   a. One- fourth of the width b. Three times the hydraulic radius
   c. Half the width d. Hydraulic mean depth

17. The best side slope for most economical trapezoidal section is
   a. 30° b. 45° c. 60° d. 75°

18. Most economical section of a triangular channel, is
   a. Equilateral triangle b. Right angled triangle
   c. Isosceles triangle d. Right angled triangle with equal sides

19. Back water curve is caused if
   a. Friction head loss is more than the bed slope
   b. Pressure is due to weir in the channel
   c. There is an increase in width of channel
   d. Flow changes from supercritical to subcritical

20. The term which is a function of cross-sectional area of the channel and flow velocity is
   a. Gradient b. Slope c. Discharge d. Stream line

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SECTION "B"

Make suitable assumptions wherever needed. The figures in the parenthesis indicate the marks allocated for the question.

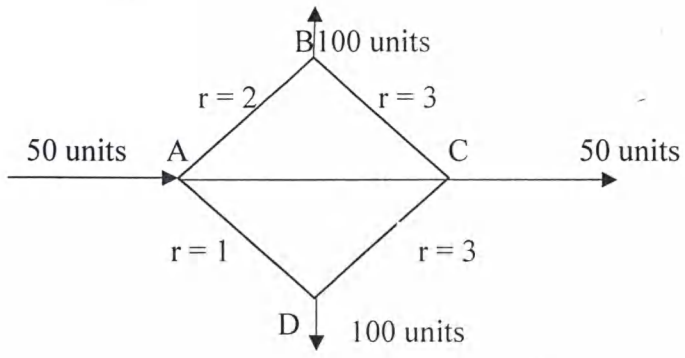
1. Describe the loss of energy in pipe flow with neat sketches. [3]

2. Three pipes which are laid in parallel have the following details. [4]

Pipes	Length	Diameter(mm)	Friction factor (f)
1	1500	1000	0.02
2	1200	300	0.02
3	1600	1200	0.024

If the total discharge through the systems is $4m^3/s$, determine the discharge distribution in three pipes and head loss.

3. Calculate the distribution of discharge in the pipe network as shown in the figure below using Hardy-Cross method. The proportionality coefficient "r" is given for each flow circuit.[till 2nd trial only] [6]



4. Derive an expression for the pressure rise due to gradual closure of valve and instantaneous closure of valve considering the pipe to be rigid. [4]

5. Establish the relationship between Chezy's and Manning's equation for Uniform flow. [3]

6. Design a trapezoidal channel with a velocity of 0.6m/s. The side slope of the channel is 1:1.5 to convey a flow discharge of $3m^3/s$. Take Manning's rugosity coefficient as 0.003 [5]

7. Calculate critical depth y_c and corresponding specific energy E_c for the following different shapes of channel when $Q = 8.5\ m^3/s$ [6]
   i. Rectangular channel (b) = 2.5m
   ii. Triangular channel with side slope 0.5H: 1V i.e. z = 0.5
   iii. Trapezoidal channel with b = 2.5 m, side slope 1.5 H : 1V, z = 1.5

OR

A rectangular channel 8m wide carries discharge of $11 m^3/s$. (Manning's n = 0.025, bed slope of 0.0016). Compute the length of backwater profile created by dam which backs up a depth 2m immediately behind the dam by direct step method. Take 3 steps to compute the profile.

8. Differentiate between [2×2= 4]
   i. Alluvial and mobile boundary channel
   ii. Dunes and Antidunes

9. Design a straight trapezoidal channel having side slope 3H: 1V (n = 3) carrying a discharge of 40 m^3/s. The longitudinal slope is 0.00025 and the channel is excavated through fine gained particle with size 8mm. Assume the particles are moderately rounded and water carries fine sediment concentrations. [Take n = 0.024 and $\phi = 24°$] [5]