

KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

Marks Scored:

Level : B.E.

Year : III

Exam Roll No. :

Time: 30 mins.

Registration No.:

Course : CIEG 301

Semester : I

F. M. : 10

Date : 28 JUL 2024

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and encircle in the most appropriate option from each set of choices

- Hydraulic gradient line (HGL) represents the sum of
 - Pressure head and kinetic head
 - Kinetic head and datum head
 - Pressure head, kinetic head and datum head
 - Pressure head and datum head
- Specific weight of a flowing fluid per unit weight is given by
 - $p/\gamma + v^2/2g$
 - $p/\gamma + y$
 - $v^2/2g + z$
 - $p/\gamma + v^2/2g + z$
- Surge tank in a pipeline is used to
 - Reduce loss of head in a pipe
 - Relieve the pressure due to water hammer
 - Make the flow uniform
 - To measure the discharge
- If three pipes of different diameters, lengths and friction factors are connected in series
 - $f = f_1 = f_2 = f_3$
 - $v = v_1 + v_2 + v_3$
 - $Q = Q_1 + Q_2 + Q_3$
 - $Q = Q_1 = Q_2 = Q_3$
- Depth at which the specific energy is minimum is known as
 - Conjugate depth
 - Critical depth
 - Alternate depth
 - Normal depth
- Which of the following has the form of Reynolds number?
 - $\Delta p/\rho v^2$
 - $v^2 L \rho / \sigma$
 - $v d \rho / \mu$
 - $v / \sqrt{g d}$
- If the depth of flow in an open channel is less than the critical depth, the flow is called.....
 - Critical flow
 - Turbulent flow
 - Subcritical flow
 - Supercritical flow
- The channel in which the flow transport sediment having the same characteristic as that of material in the channel is called.....
 - Prismatic
 - Alluvial
 - Non- Prismatic
 - Rigid boundary channel
- The force exerted by the flowing liquid on the channel perimeter is called.....
 - Normal force
 - Pressure force
 - Tractive force
 - Lift force
- In Hardy Cross method of solving pipe network, the algebraic sum of head losses round each loop must be
 - Positive
 - Zero
 - Negative
 - One
- The dynamic equation of gradually varied flow is given by.....
 - $S_b - S_f = (dy/dx) [1 - (Q^2 T / g A^3)]$
 - $S_f - S_b = (dy/dx) [1 - (Q^2 T / g A^3)]$
 - $S_b - S_f = [1 - (Q^2 T / g A^3)]$
 - $S_b - S_f = (dy/dx) [1 - (Q^2 A^3 / g T)]$

12. In uniform flow there is a balanced between
- | | |
|-----------------------------------|---------------------------------|
| a. Gravity and frictional forces | b. Gravity and inertial forces |
| c. Inertial and frictional forces | d. Inertial and viscous forces. |
13. A hydraulic jump occurs when there is a break in grade from a
- | | |
|---------------------------------|-------------------------------|
| a. Mild slope to steep slope | b. Steep slope to mild slope |
| c. Steep slope to steeper slope | d. Mild slope to milder slope |
14. Identify the incorrect statement:
- | | |
|--|--|
| a. Mild slope channels are M_1 , M_2 , and M_3 | b. Adverse slope channels are A_2 and A_3 |
| c. Horizontal channels are H_1 and H_3 | d. Critical slope channels are C_1 and C_3 |
15. For maximum discharge through a circular channel, the depth of flow should be equal to
- | | |
|---|--|
| a. 0.6 times the diameter of the channel | b. 0.8 times the diameter of the channel |
| c. 0.95 times the diameter of the channel | d. 1.2 times the diameter of the channel |
16. Under which of the following conditions the closure of valve is considered sudden
- | |
|---|
| a. The duration of valve closure greater than $2L/C$ |
| b. The duration of valve closure is less than L/C |
| c. The duration of valve closure is less than $2L/C$ |
| d. The duration of valve closure is greater than $2C/L$ |

Where L and C has their usual meanings

17. The most economical section of a trapezoidal channel is the one which has
- | | |
|--------------------------------------|----------------------------------|
| a. Breadth half the depth | b. Depth half the sloping side |
| c. Hydraulic radius half the breadth | d. Side slope half the top width |
18. In a hydraulic jump the energy loss is expressed as
- | | | | |
|-----------------------------|-----------------------------|---------------------------|---------------------------------|
| a. $(y_2 - y_1)^2/4y_1.y_2$ | b. $(y_2 - y_1)^3/4y_1.y_2$ | c. $(y_2 - y_1)/4y_1.y_2$ | d. $(y_2 - y_1)^{1/2}/4y_1.y_2$ |
|-----------------------------|-----------------------------|---------------------------|---------------------------------|
19. The loss of head at entrance of a pipe is (where v = velocity of water in the pipe)
- | | | | |
|-------------|-------------------|--------------------|--------------------|
| a. $v^2/2g$ | b. $(0.5*v^2)/2g$ | c. $(0.35*v^2)/2g$ | d. $(0.75*v^2)/2g$ |
|-------------|-------------------|--------------------|--------------------|
20. Kinematic similarity between the model and prototype is the
- | | |
|----------------------------|--------------------------|
| a. Similarity of motion | b. Similarity of lengths |
| c. Similarity of discharge | d. Similarity of forces |

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Course : CIEG 301
Semester : I
F. M. : 40

SECTION "B"

Attempt *ALL* questions. Make suitable assumptions when needed. The figures in the parenthesis indicate the marks allocated for the question.

1. What do you understand by hydraulic models? What type of models would you prefer in making river models? And why? [1+2]
2. A spillway 7m high and 70m long discharges $500\text{m}^3/\text{s}$ under a head of 2m. If a 1:6 model of the spillway is to be constructed, find the model dimensions, head over the model and the model discharge. [3]
3. Differentiate GVF and RVF with examples. [3]
4. Steel pipe 2 km long x 60cm diameter x 1.2cm wall thickness conveys water at the rate of $2\text{ m}^3/\text{s}$. Determine the increase in pressure when a valve provided at D/S end of pipe is closed instantaneously. Consider the pipe to be elastic and take bulk modulus of water $k = 2 \times 10^9\text{ N/m}^2$, and modulus of elasticity of steel $E = 2 \times 10^{11}\text{ N/m}^2$. [3]
5. Write short notes on (*ANY FOUR*) [4 × 2.5 = 10]
 - a. Specific energy and specific energy curve
 - b. Backwater curve and afflux
 - c. Various kinds of bed forms
 - d. Mobile boundary channel
 - e. Most economical channel section
6. In a wide rectangular channel, if normal depth is increased by 25% find the increase in discharge. [4]
7. A trapezoidal channel is 5m wide and has a bed slope of 0.0003, and $N = 0.02$. If the side slope is 0.5H: 1V, determine the discharge which makes the channel economic. [4]
8. Design a non-erodible boundary channel laid on a slope of 0.002 with discharge of $10\text{m}^3/\text{s}$. Assume manning's $N = 0.015$ with permissible velocity of 1.2m/s. [5]
9. A rectangular channel 6m wide, discharges water at normal depth 2 m, the bed slope is 1/4000 and manning's $N = 0.016$. A dam placed downstream raises the level to a height of the profile to 4.5 m immediately behind the dam; determine the length of the profile by direct step method. (Two step only) [5]

