

KATHMANDU UNIVERSITY
End Semester Examination
February/March 2019

Marks Scored:

Level : B. E

Course : CIEG 301

Year : III

Semester : I

Exam Roll No. :

Time: 30 mins

F. M. : 10

Registration No.:

Date

17 FEB 2019

SECTION "A"

[20 Q × 0.5 = 10 marks]

Tick (✓) the most appropriate answer.

1. Hydraulic grade line in a conduit
 - a. Remains above the centre line
 - b. Remains below the centre line of conduit
 - c. Remains parallel to the centre line of conduit
 - d. May be above or below the centre line of conduit

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

3. A pipe of 0.1 m^2 cross sectional area suddenly enlarges to 0.3 m^2 cross sectional area. If the discharge of the pipe is 0.3 m^3 , head loss is
 - a. 0.3 m
 - b. 0.4 m
 - c. 0.1 m
 - d. 0.2 m

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

5. Most economical section of a triangular channel is
 - a. Equilateral triangle
 - b. Right angled triangle
 - c. Isosceles triangle with 45° vertex angle
 - d. Right angled triangle with equal sides

6. The intensity of pressure due to sudden closure of a valve of a pipe (elastic) in which water flows with velocity v , is directly proportional to
 - a. Square root of the bulk modulus of elasticity of water
 - b. Bulk modulus of elasticity of water
 - c. Specific weight of water
 - d. Density of water

7. The side slope of Cipolletti weir is generally kept
 - a. 1 to 4
 - b. 1 to 3
 - c. 1 to 2
 - d. 1 to 5

8. The flow in open channel is said to be subcritical if the Froude' s number is
 - a. Less than 1
 - b. Equal to 1
 - c. Greater than 1
 - d. Greater than 10

9. A rectangular channel, 6m wide and 3m deep is running full with bed slope 1: 2000 and Chezy's constant $C = 55$. The hydraulic radius is
 a. 1.5 b. 2.5 c. 1.2 d. 1.7
10. For a most economical rectangular channel, the hydraulic radius is equal to
 a. The depth of flow b. Half the depth of flow
 c. One third the depth of flow d. Twice the depth of flow
11. For critical depth of flow of water in open channels, the specific energy must be....
 a. Minimum b. Maximum
 c. Average of maximum and minimum d. Equal to 1
12. The flow in open channel is laminar, if the Reynold number is
 a. Less than 2000 b. Greater than 2000
 c. Greater than 4000 d. Less than 500
13. The notch angle for maximum discharge over a triangular notch is
 a. 30° b. 90° c. 60° d. 120°
14. The phenomenon of occurring in an open channel when a rapidly flowing stream abruptly changes to a slowly flowing stream causing a distinct rise of liquid surface, is
 a. Water hammer b. Hydraulic jump c. Critical discharge d. Specific discharge
15. A pipe consisting of several pipes of varying diameter and lengths, may be replaced by an equivalent pipe of diameter D of length
 a. $L = D^4 (L_1/d_1^4 + L_2/d_2^4 + L_3/d_3^4 + \dots)$
 b. $L = D^3 (L_1/d_1^3 + L_2/d_2^3 + L_3/d_3^3 + \dots)$
 c. $L = D^5 (L_1/d_1^5 + L_2/d_2^5 + L_3/d_3^5 + \dots)$
 d. $L = D^2 (L_1/d_1^2 + L_2/d_2^2 + L_3/d_3^2 + \dots)$
16. In open channels gradually varied flow is caused
 a. When the channel slope is equal to the normal slope
 b. When the pressure forces and the change of momentum are different from each other
 c. When the force causing the flow is not equal to the resistance force
 d. When there is an equilibrium between the forces causing the flow and these opposing it.
17. In a hydraulic jump the energy loss is expressed
 a. $(y_2 - y_1)^2 / 4 y_1 y_2$ b. $(y_2 - y_1)^3 / 4 y_1 y_2$ c. $(y_2 - y_1) / 4 y_1 y_2$ d. $(y_2 - y_1)^4 / 4 y_1 y_2$
18. 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
19. In a rectangular channel, the critical depth is given by
 a. $(q^2/g)^{1/2}$ b. $(q^2/g)^{1/3}$ c. $(q^2/g)^{1/4}$ d. $(q^3/g)^{1/3}$
20. Prismatic channels are those which have
 a. A constant bed slope downstream
 b. The same cross-section and bed slope throughout
 c. The shape of a prism
 d. A uniform cross-section throughout

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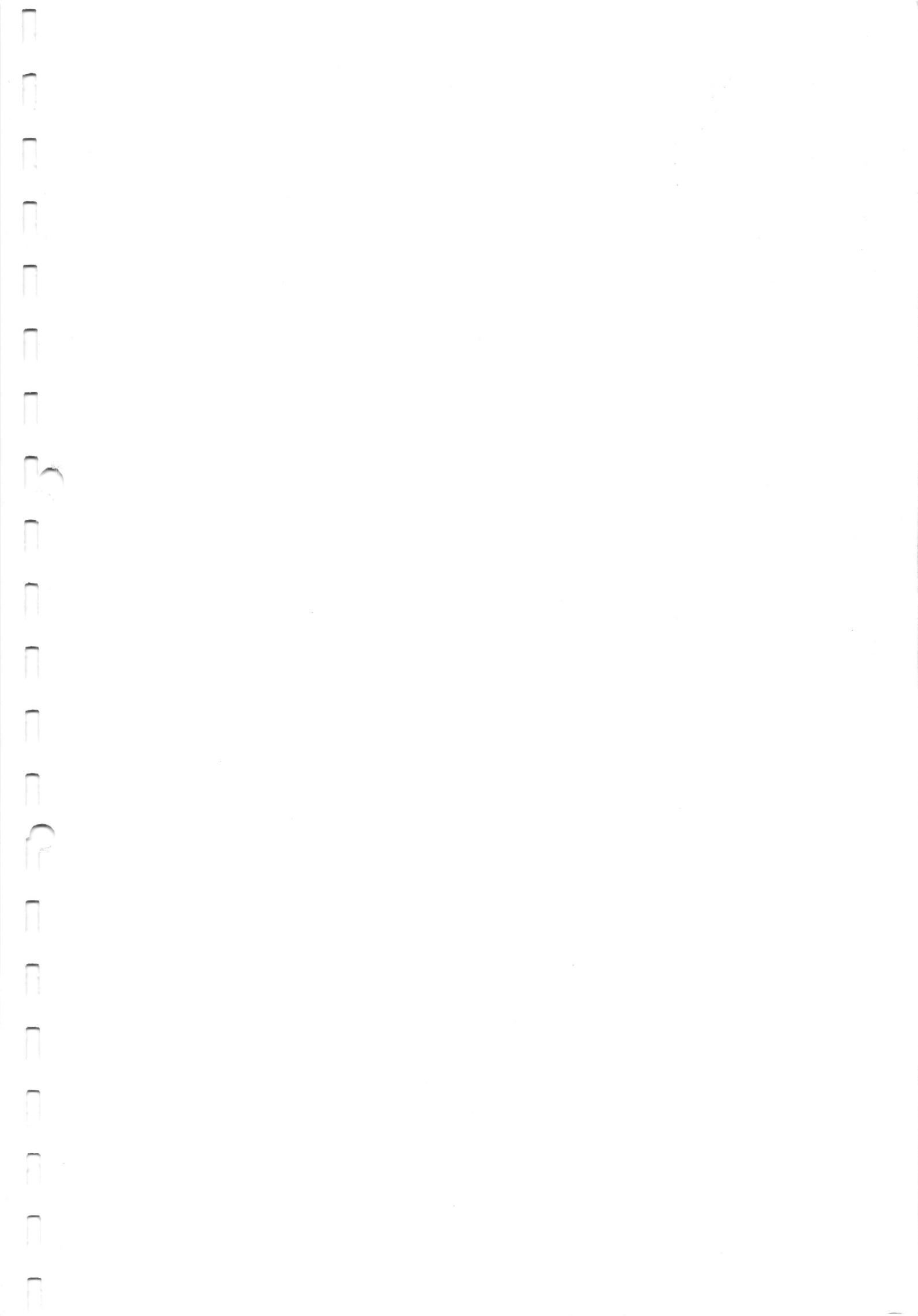
Level : B. E
Year : III
Time : 2 hrs. 30 mins.

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

SECTION "B"

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

1. A 7.2 m high and 15 m long spillway discharges $94 \text{ m}^3/\text{s}$ of discharge under a head of 2.03 m. If 1: 9 scale model of this spillway is to be constructed, determine model dimensions, head over spillway model and the model discharge. If model experiences a force of 7500 N, determine force on the prototype. [4]
2. Water flows at a steady and uniform depth of 2 m in an open channel of rectangular cross-section having base width equal to 5 m and laid at a slope of 1 in 1000. It is desired to obtain critical flow in the channel by providing a hump in the bed. Calculate the height of the hump and sketch the flow profile. Consider the value of Manning's rugosity coefficient $N = 0.02$ for the channel surface. [5]
3. A rectangular channel 4 m wide has depth of water 1.5 m. The slope of the bed of the channel is 1 in 1000 and value of Chezy's constant $C = 55$. It is desired to increase the discharge to a maximum by changing the dimensions of the section for constant area of cross section, slope of the bed and roughness of the channel. Find the new dimensions of the channel and increase in discharge. [5]
4. In a pressure Penstock 4500 m long water is flowing at 4 m/s. If the velocity of the pressure wave travelling in the pipe due to sudden complete closure of a valve at the downstream end is given as 1500 m/s, Find : [2]
 - i. The maximum pressure rise and
 - ii. The period of oscillation
5. Differentiate between rigid boundary channel and mobile boundary channel [2]
6. In a wide rectangular mobile boundary channel with mean velocity 0.6 m/s, depth of flow is 0.6 m, sediment particle diameter 0.915 mm, specific gravity of sediment 2.65, longitudinal slope 1/6000 and kinematic viscosity of water $10^{-6} \text{ m}^2/\text{s}$. Examine the possibility of motion of sediment particle by Shields tractive force theory. [4]
7. Differentiate between distorted and undistorted model. In what conditions they are preferred. [3]
8. Write short notes on (*ANY THREE*) [3 × 3 = 9]
 - a. Water hammer
 - b. Water surface profiles of GVF
 - c. Hardy Cross method
 - d. Formation of Bed
9. A weir is installed across a rectangular open channel thereby raising the flow depth from 1.5 m in a normal flow to 2.5 m at the weir. The width of the channel is 10 m and it is laid to a slope of 1 in 10000. Find an approximate length of the backwater curve considering the average velocity, average depth and average slope midway between the two sections. Take the value of Manning's rugosity coefficient equal to 0.02. [6]



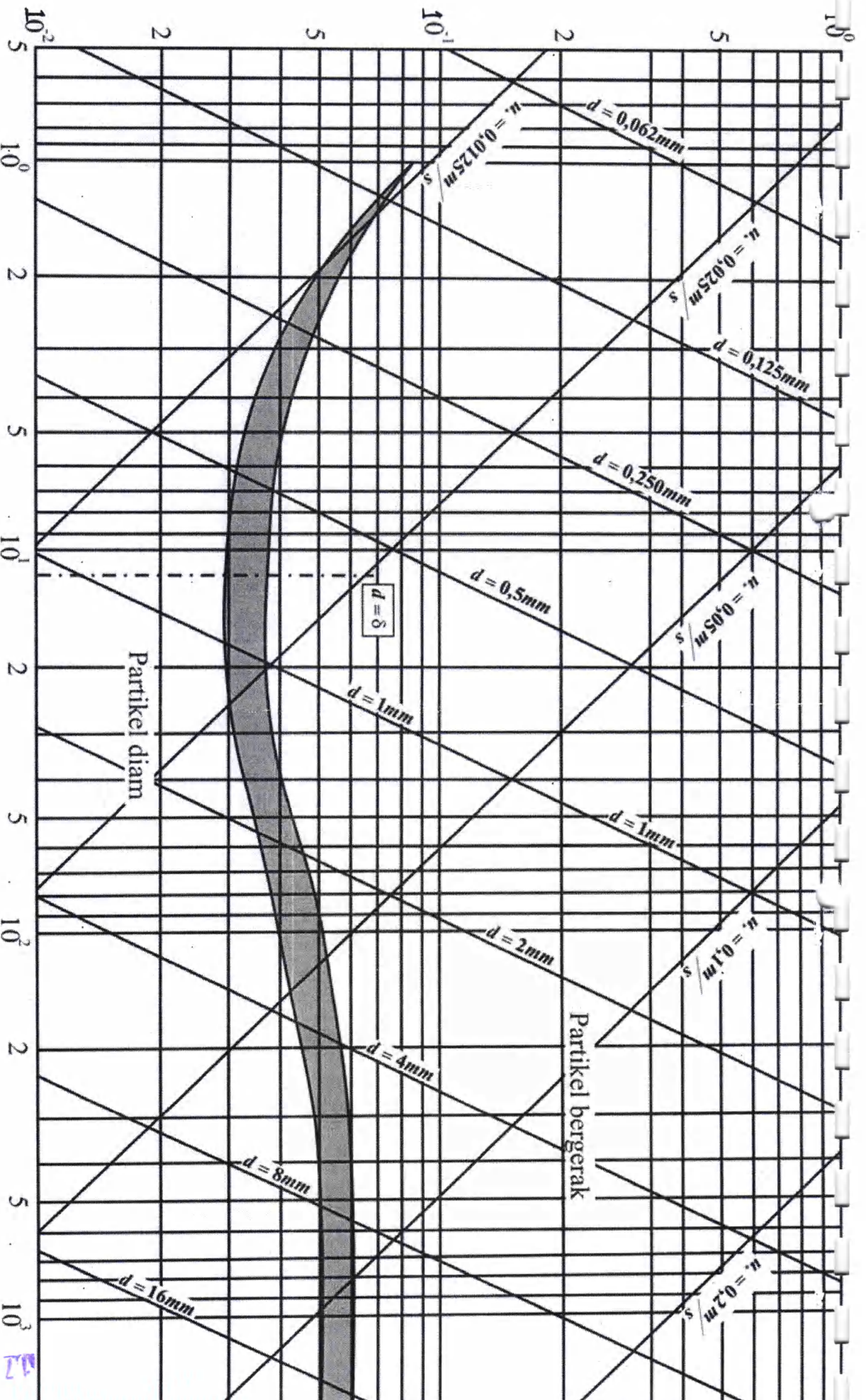


Table - CIGG-301

$$Re_p = \frac{u \cdot d}{\nu} = 11,6 \frac{d}{\delta}$$

