Indian Maritime University

(A Central University, Govt. of India)

End Semester Examinations – June 2023

Programme Name: M.Tech (DHE)

Semester: 2

Subject Code: PG12T1201

Subject Name: DREDGING EQUIPMENT AND SLURRY TRANSPORTATION

Date: 26.05.2023	Max Marks: 60
Duration: 03 Hrs	Pass Marks: 30

General Instructions

(i) All Sections (A, B & C) are to be attempted.
(ii) Options, if any, are specified in respective sections.

SECTION – A (Answer all. Each carries 1 mark.)

1. In slurry transport context, PSD stands for.....

2. The Fanning friction expressed in terms of Reynolds number equals .....

3. Moody's chart is a plot between ..... and .....

4. The ratio of the weights between a real sand particle and a sphere of the same diameter as the particle is called.....

5. State True or False: Terminal settling velocity is greater than Hindered settling velocity.

6. Compared to a reciprocating pump, the speed of a centrifugal pump is:
   a. Higher
   b. Lower
   c. Depends on the fluid being handled
   d. Depends on the will of the operator

7. For measuring the friction between soil particle and the pipe wall, which one of the following is used?
   a. Repose angle
   b. Angle of internal friction
   c. Angle of external friction
   d. Mohr's angle

8. The relative excess head losses proportional to:
   a. Richardson number to some power
   b. Froude number to some power
   c. Thuy number to some power
   d. Reynold number to some power

9. The ratio of inertia force to viscous force is called:
   a. Reynolds number
   b. Froude number
   c. Weber number
   d. Mach number

10. The dimensionless number which is of practical importance in weather forecasting and in investigating density and turbidity currents in oceans, lakes and reservoirs is:
   a. Reynold number
   b. Richardson number
   c. Froude number
   d. Weber number

SECTION – B (Answer all)

11. Briefly explain the term: Hindered settling velocity (2 marks)

12. Briefly explain the term: Archimedes number (2 marks)

13. Name any four regimes of flow in slurry transportation. (2 marks)

14. Blriefly explain the term: Relative Submerged Density. (2 marks)

15. Write any two expressions for Darcy Weisbach friction factor. (2 marks)

SECTION – C (Answer any FIVE)

16. With the help of a graph and proper labeling, explain the various flow regimes in context of slurry transportation. (8 marks)

17. Draw the various performance curves for a centrifugal pump and label it. (8 marks)

18. A sand particle is falling through water at 20°C. The following data is given:
   Density of water = 1000 kg/m^3

   Diameter of the sand particle, d=0.15 mm

Density of the sand = 1250 kg/m^3
The shape factor of the sand particle as = 0.7
The drag coefficient = 0.7
Kinematic viscosity of water at 20°C = 1X10^{-6} m^2/s

Evaluate the following:

a. Terminal settling velocity of the particle. (4 marks)
b. Reynolds number of the particle. (4 marks)

19. Discuss the term shear velocity and how it is calculated. (8 marks)

20. Discuss viscous sublayer thickness and the method to evaluate it. (8 marks)

21. Derive the continuity equation for 3-D fluid flow in Cartesian coordinate system. (8 marks)

22. A flow of 7 litres of a fluid (of specific gravity=0.91 and viscosity 0.124 Pa.s) is pumped through a pipeline 75 mm diameter having a length of 62m and whose outlet is 3m higher than its inlet. Estimate the power required for the pump if it's efficiency is 60%. (8 marks)