Printed Page:- **Subject Code:- AME0402**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - CARRY OVER THEORY EXAMINATION - APRIL 2023

Subject: Fluid Mechanics & Fluid Machines

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* **three Sections -A, B, & C.** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION A **20**

1. Attempt all parts:-

1-a. Specific gravity is what kind of property? (CO1) 1

(a) Intensive

(b) Extensive

(c) None of the mentioned

(d) It depends on external conditions

1-b. The specific gravity of a liquid has (CO1) 1

(a) the same unit as that of mass density

(b) the same unit as that of weight density

(c) the same unit as that of specific volume

(d) no unit

1-c. What will be the shape of the path-line for an one-dimensional flow be like? (CO2) 1

(a) Straight line

(b) Parabolic

(c) Hyperbolic

(d) Elliptical

1-d. The continuity equation is based on the principle of (CO2) 1

(a) Conservation of mass

(b) Conservation of momentum

(c) Conservation of energy

(d) Conservation of force

1-e. The total head loss for the system is equal to (CO3) 1

(a) Pipe length

(b) Pipe diameter

(c) Width of the reservoir

(d) Height difference of reservoirs

1-f. The head loss at the entrance of the pipe is that at it's exit (CO3) 1

(a) equal

(b) half

(c) twice

(d) four times

1-g. Francis and Kaplan turbines are known as (CO4) 1

(a) Impulse turbine

(b) Reaction turbine

(c) Axial flow turbine

(d) Mixed flow turbine

1-h. Pipes of largest diameter which carry water from reservoir to the turbines is known as (CO4) 1

(a) Head stock

(b) Pen stock

(c) Tail stock

(d) None of the mentioned

1-i. Internal cavitation in pump occurs due to (CO5) 1

(a) Drag force

(b) Cyclic stress

(c) Shock waves

(d) Flow speed

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1-j. Centrifugal pumps are used to transport (CO5) 1

(a) Pressure

(b) Speed

(c) Power

(d) Fluid

2. Attempt all parts:-

2.a. Define mass density and specific weight. (CO1) 2

2.b. What is loss of head due to friction? (CO2) 2

2.c. What is gauge pressure? (CO3) 2

2.d. What are the classifications of turbine? (CO4) 2

2.e. What does indicator diagram indicates? (CO5) 2

SECTION B 30

3. Answer any <u>five</u> of the following:-

3-a. Determine the viscosity of fluid having kinematic viscosity is 6 stokes and specific gravity is 0.9. (CO1) 6

3-b. What is Surface Tension? Give the mathematical expression of surface tension for a soap bubble and water droplet? (CO1) 6

3-c. What is velocity potential? Also derive the Laplace equation for velocity potential. (CO2) 6

3-d. If for a 2-D potential flow, the velocity potential is given by $\Phi = x(2y - 1)$. Determine the velocity at the point P(4, 5). Determine also the value of stream function at the point P. (CO2) 6

3.e. What is turbulent flow? Write down the various types of turbulence. (CO3) 6

3.f. What is function of draft tube and explain its types? (CO4) 6

3.g. Define a centrifugal pump. Explain the working of a single stage centrifugal pump with neat sketches. (CO5) 6

SECTION C 50

4. Answer any <u>one</u> of the following:-

4-a. What do you understand by gauge and vacuum pressure? State and prove the Pascal's law. Also give its practical applications. (CO1) 10

4-b. Explain hydrostatic law. An open tank contains water up to 1m depth and height of oil of specific gravity 0.8 above water is 60cm. Find the pressure at (i) At the bottom of tank (ii) At the interface of water and oil and (iii).At 80 cm from the free surface? (CO1) 10

5. Answer any <u>one</u> of the following:-

5-a.	Using Buckingham's pi theorem, show that the discharge, Q consumed by an oil ring is given by, $Q = Nd^3 \Phi [\mu/(\rho Nd^2), (\sigma/ (\rho N^2 d^3), w/(\rho N^2 d)]$ Where, d is internal diameter of ring, N is rotational speed, ρ is density, μ is viscosity, σ is surface tension and w is the specific weight of oil. (CO2)	10
5-b.	Define the term "dimensionless numbers". Discuss some important dimensionless numbers and their significance with applications. (CO2)	10

6. Answer any <u>one</u> of the following:-

6-a.	Derive an expression for head loss in power transmission through pipes. (CO3)	10
6-b.	A pipe of diameter 300 mm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipe is 500 m. Find the maximum power available at the outlet, if the value of friction factor = 0.006. (CO3)	10

7. Answer any <u>one</u> of the following:-

7-a.	Show that in case of jet striking the series of flat plates mounted on wheel periphery, the efficiency will be maximum when tangential velocity of wheel is half of the jet. (CO4)	10
7-b.	Describe working and constructional features of Pelton turbine. Also explain different efficiencies of the turbine.(CO4)	10

8. Answer any <u>one</u> of the following:-

8-a.	What is air vessel? Also describe the function of air vessel? Explain the term negative slip as used in reciprocating pump. why and when negative slip occurs. (CO5)	10
8-b.	A centrifugal pump having outer diameter equal to two times of inner diameter and running at 1000 rpm. Works against a head of 40 m, the velocity of flow through the impeller is constant and equal to 2.5 m/s; the vanes are set back at an angle of 40^0 at outlet. If the outer dia. of the impeller is 500 mm and width at the outlet is 50 mm. Determine, (i) Vane angle at inlet (ii) Work done by impeller on water per second (iii) Mechanical efficiency. (CO5)	10