



BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – Dip.ME-2024

Course Name – Fluid Mechanics and Machinery

Course Code - DME40109

(Semester IV)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Identify from the following that is true for real fluid. 1. Is incompressible 2. Has surface tension 3. Is viscous
 - a) Only 1
 - b) Both 2 and 3
 - c) Only 3
 - d) Both 1 and 2
- (ii) Memorise the desirable properties of any practical fluids.
 - a) Should be viscous
 - b) Should possess surface tension
 - c) Should be compressible
 - d) All of the mentioned
- (iii) Select the property of a fluid responsible for rising in thin capillaries, also known as capillary action.
 - a) Mass
 - b) Kinematic viscosity
 - c) Surface tension
 - d) Temperature
- (iv) Select the correct option: Weber's number is important in the following flow situation:
 - a) Capillary movement of water in soil
 - b) Motion of the submarine is completely underwater
 - c) Pressure rise due to the sudden closure of valves
 - d) Flow over the spillway of a dam
- (v) Identify from the following that is the primary quantity.
 - a) Volume
 - b) Speed
 - c) Density
 - d) Mass
- (vi) Identify from the following parameter that decides the flow in 'laminar' or 'turbulent'.
 - a) Reynold's number
 - b) Mach number
 - c) Froude number
 - d) Knudsen number
- (vii) State the approximate value of lower critical Reynolds number .
 - a) 100
 - b) 200

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- c) 1000
(viii) Identify the highest point of a syphon.
a) Syphon top
c) Reservoir
- d) 2000
b) Summit
d) Elevation
- (ix) Select the bend angle for the maximum head loss in a pipe.
a) 60 degree
c) U-bend
- b) 90 degree
d) 30 degree
- (x) Interpret the dependency of the friction factor in a rough turbulent flow.
a) Velocity of flow
c) Type of fluid flowing
- b) pipe diameter
d) Pipe condition and pipe diameter
- (xi) State the head loss due to turbulence flow as compared to laminar flow.
a) less
c) equal
- b) more
d) unpredictable
- (xii) Identify from the following that is suitable for the Kaplan turbine.
a) low head and low discharge
c) high head and low discharge
- b) low head and high discharge
d) high head and high discharge
- (xiii) Calculate the number of buckets on the runner of a Pelton turbine if the jet ratio is 12.
a) 20
c) 6
- b) 21
d) 13
- (xiv) Identify from the following: The main function of a centrifugal pump is
a) to transfer temperature
c) to transfer speed
- b) to transfer energy
d) to transfer pressure
- (xv) State the pressure that is suitable for reciprocating pumps.
a) low
c) high
- b) low and high
d) None of these

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Estimate the discharge over a triangular notch of angle 60 degrees when the head over the V-notch is 0.3 meters. Assume $C_d=0.6$. (3)
3. Define and classify the centrifugal pumps. (3)
4. Explain the terms meta centre and meta centric height. (3)
5. Define the continuity equation and Bernoulli's equation. (3)
6. Describe Buckingham's Pi theorem in Dimensional analysis. (3)

OR

Water is flowing through a pipe of diameter 30 cm at a velocity of 4 m/s. Estimate the velocity of oil flowing in another pipe of diameter 10 cm, if the condition of dynamic similarity is satisfied between the two pipes. The viscosity of water and oil is given as 0.01 poise and 0.25 poise. The sp. gr. of oil = 0.8. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. A syphon of diameter 200 mm connects two reservoirs having a difference in elevation of 20 meter. The length of the syphon is 500 meter and the summit is 3 meter above the water level in the upper reservoir. The length of the pipe from upper reservoir to the summit is 100 meter. Determine the discharge through the syphon and also pressure at the summit. Neglect minor losses. The co-efficient of friction $f=0.005$. (5)

8. Differentiate between: a) The impulse and reaction turbines b) Radial and axial flow turbines, (5)
c) Inward and outward radial flow turbine, and d) Kaplan and propeller turbines.
9. The dynamic viscosity of an oil, used for lubrication between a shaft and sleeve, is 6 poise. The shaft is of a diameter of 0.4 meters and rotates at 190 r.p.m. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm. (5)
10. A 15 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. Both cylinders are 25 cm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12 Nm is required to rotate the inner cylinder at 100 r.p.m., determine the viscosity of the fluid. (5)
11. Explain the principle of the venturimeter with a neat sketch. Derive the expression for the rate of flow of fluid through it. (5)
12. Distinguish between : (i) Steady flow and Unsteady flow, (ii) Uniform and Non-uniform flow, (5)
(iii) Compressible and incompressible flow, (iv) Laminar flow and Turbulent flow.

OR

A pitot tube is fitted in a pipe to measure the flow velocity of a fluid ($S=0.8$), evaluate the flow velocity if the manometer reading fitted to the Pitot-tube tapping is measured as 80 mm of mercury. (5)
