

**University of Mumbai**  
**Examination 2021 under cluster 9 (FAMT)**

**Examinations Commencing from 1<sup>st</sup> June 2021**

Program: Mechanical Engineering

Curriculum Scheme: Rev 2019

Examination: SE Semester IV

Course Code: MEC402 and Course Name: Fluid Mechanics

Time: 2 hour

Max. Marks: 80

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| Q1.       | Choose the correct option for following questions. All the Questions are compulsory and carry equal marks                                                           |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.        | If liquid has specific gravity 0.2, then what is weight density of the liquid?                                                                                      |
| Option A: | 200 N/m <sup>3</sup>                                                                                                                                                |
| Option B: | 2000 N/m <sup>3</sup>                                                                                                                                               |
| Option C: | 1962 N/m <sup>3</sup>                                                                                                                                               |
| Option D: | 1.962 N/m <sup>3</sup>                                                                                                                                              |
| 2.        | A fluid in which shear stress ..... than the yield value & shear stress is not proportional to the rate of shear strain is known as.....                            |
| Option A: | more, Thixotropic fluid                                                                                                                                             |
| Option B: | less, Thixotropic fluid                                                                                                                                             |
| Option C: | more, Ideal plastic fluid                                                                                                                                           |
| Option D: | less, Ideal plastic fluid                                                                                                                                           |
| 3.        | The magnitude of the buoyant force can be determined by                                                                                                             |
| Option A: | Archimedes' principle                                                                                                                                               |
| Option B: | Newton's second law of motion                                                                                                                                       |
| Option C: | Principle of moments                                                                                                                                                |
| Option D: | Principle of energy                                                                                                                                                 |
| 4.        | In dimensional analysis the Buckingham's $\pi$ -theorem is widely used and expresses the resulting equation in terms of                                             |
| Option A: | the repeating variables                                                                                                                                             |
| Option B: | geometric, kinematic and dynamic variables                                                                                                                          |
| Option C: | (n – m) dimensionless parameters                                                                                                                                    |
| Option D: | n dimensionless parameters                                                                                                                                          |
| 5.        | A ..... gives the path of one particular particle at successive instants of time, whereas..... indicates the direction of a number of particles at the same instant |
| Option A: | path line, stream line                                                                                                                                              |
| Option B: | path line, energy line                                                                                                                                              |
| Option C: | stream line, Streak line                                                                                                                                            |
| Option D: | path line, vertical line                                                                                                                                            |
| 6.        | Find the velocity at a point (1, 1, 2) after 1 sec. for a 3D flow given by $u = yz$ , $v =$                                                                         |

|           |                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------|
|           | $xz - t$ , $w = xy + t$ m/s                                                                           |
| Option A: | 1                                                                                                     |
| Option B: | 2                                                                                                     |
| Option C: | 3                                                                                                     |
| Option D: | 0.5                                                                                                   |
|           |                                                                                                       |
| 7.        | In ..... method equations of motion are very difficult to solve and the motion is hard to understand. |
| Option A: | Eulerian Method                                                                                       |
| Option B: | Langrangian Method                                                                                    |
| Option C: | viscous method                                                                                        |
| Option D: | pressure method                                                                                       |
|           |                                                                                                       |
| 8.        | ..... is not a assumptions of Bernoulli's equation                                                    |
| Option A: | The liquid is ideal                                                                                   |
| Option B: | The flow is steady and continuous                                                                     |
| Option C: | The liquid is incompressible                                                                          |
| Option D: | Fluid is in static condition                                                                          |
|           |                                                                                                       |
| 9.        | The term $V^2 / 2g$ is known as                                                                       |
| Option A: | kinetic energy                                                                                        |
| Option B: | pressure energy                                                                                       |
| Option C: | kinetic energy per unit weight                                                                        |
| Option D: | Potential energy                                                                                      |
|           |                                                                                                       |
| 10.       | In which of the following measuring devices Bernoulli's equation is not used:                         |
| Option A: | Venturimeter                                                                                          |
| Option B: | Orificemeter                                                                                          |
| Option C: | Pitot tube                                                                                            |
| Option D: | Manometer                                                                                             |
|           |                                                                                                       |
| 11.       | $F \cdot dt = d(mv)$ This equation is called as                                                       |
| Option A: | Euler momentum equation                                                                               |
| Option B: | Navier stokes equation                                                                                |
| Option C: | Impulse-momentum equation                                                                             |
| Option D: | Energy equation                                                                                       |
|           |                                                                                                       |
| 12.       | The co-efficient of discharge of an Orificemeter is..... that of a Venturimeter.                      |
| Option A: | equal to                                                                                              |
| Option B: | smaller than                                                                                          |
| Option C: | much more than                                                                                        |
| Option D: | depend on working condition                                                                           |
|           |                                                                                                       |
| 13.       | What is fully developed flow?                                                                         |
| Option A: | Where pressure is constant along flow direction                                                       |
| Option B: | Where velocity is constant along flow direction                                                       |
| Option C: | Where force is constant along flow direction                                                          |
| Option D: | Where temperature is constant along flow direction                                                    |
|           |                                                                                                       |

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| 14.       | Find Reynolds number if velocity of fluid is 2 m/s and density of fluid $800 \text{ kg/m}^3$ and Viscosity $0.2 \text{ N.s/m}^2$ is flowing through 0.25 m diameter pipe. |
| Option A: | 2000                                                                                                                                                                      |
| Option B: | 200                                                                                                                                                                       |
| Option C: | 20                                                                                                                                                                        |
| Option D: | 2                                                                                                                                                                         |
|           |                                                                                                                                                                           |
| 15.       | In Navier stokes equation consider following forces                                                                                                                       |
| Option A: | Pressure and gravitational forces                                                                                                                                         |
| Option B: | Viscous, gravitational and pressure forces                                                                                                                                |
| Option C: | Viscous, gravitational and surface tension forces                                                                                                                         |
| Option D: | Pressure and viscous forces                                                                                                                                               |
|           |                                                                                                                                                                           |
| 16.       | Potential, kinetic and pressure heads are considered for                                                                                                                  |
| Option A: | Energy gradient line                                                                                                                                                      |
| Option B: | Potential gradient line                                                                                                                                                   |
| Option C: | Hydraulic gradient line                                                                                                                                                   |
| Option D: | Pressure gradient line                                                                                                                                                    |
|           |                                                                                                                                                                           |
| 17.       | When the pipes are connected in parallel, the total loss of head                                                                                                          |
| Option A: | is equal to the sum of the loss of head in each pipe                                                                                                                      |
| Option B: | is same as in each pipe                                                                                                                                                   |
| Option C: | is equal to the reciprocal of the sum of loss of head in each pipe                                                                                                        |
| Option D: | is equal to the difference of the losses of head in pipes                                                                                                                 |
|           |                                                                                                                                                                           |
| 18.       | In a pipe flow the minor losses are those                                                                                                                                 |
| Option A: | which depend on the length of the pipeline                                                                                                                                |
| Option B: | caused by friction and are thus also called friction losses.                                                                                                              |
| Option C: | which have a large magnitude                                                                                                                                              |
| Option D: | which are caused on account of total disturbance produced by such fittings as valves, bends, etc                                                                          |
|           |                                                                                                                                                                           |
| 19.       | Which of following statements is correct for bluff bodies?                                                                                                                |
| Option A: | The total drag is considerably larger as compared to that for streamlined bodies                                                                                          |
| Option B: | No friction drag act on the bodies                                                                                                                                        |
| Option C: | The total drag is much less as compared to that for streamlined bodies                                                                                                    |
| Option D: | Bodies are coincided with the stream line                                                                                                                                 |
|           |                                                                                                                                                                           |
| 20.       | Boundary layer on a flat plate is called laminar boundary layer if                                                                                                        |
| Option A: | Reynolds number is less than 2000                                                                                                                                         |
| Option B: | Reynolds number is less than 4000                                                                                                                                         |
| Option C: | Reynolds number is less than $5 \times 10^5$                                                                                                                              |
| Option D: | Reynolds number is more than $5 \times 10^5$                                                                                                                              |

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| <b>Q2.<br/>(20 Marks)</b> | <b>Solve any Four Questions out of Six (5 marks each).</b>                                                                                                                                                                                                                                                                                                                                  |
| A                         | Write short notes on types of fluids                                                                                                                                                                                                                                                                                                                                                        |
| B                         | Define stream function and velocity potential function.                                                                                                                                                                                                                                                                                                                                     |
| C                         | A venturimeter with 150 mm diameter at inlet and 100 mm at throat is laid with its axis horizontal and is used for measuring the flow of oil of sp. gr. 1. The oil mercury differential manometer shows a gauge difference of 200 mm. Calculate the discharge. Assume the co-efficient of meter as 0.98.                                                                                    |
| D                         | An oil of viscosity 1 poise and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 300 m. The rate of flow of liquid is $0.0035 \text{ m}^3/\text{s}$ . Find the pressure drop in a length of 300 m and shear stress at the wall.                                                                                                                      |
| E                         | The main pipe divides into two parallel pipes which again form one pipe. The data is as follows : First parallel pipe; Length = 900 m; diameter = 0.7 m; Second parallel pipe : Length = 900 m; diameter = 0.5 m; Coefficient of friction for each parallel pipe = 0.0045. If the total rate of flow in the main is $1.8 \text{ m}^3/\text{s}$ find the rate of flow in each parallel pipe. |
| F                         | Write short note on boundary layer separation.                                                                                                                                                                                                                                                                                                                                              |

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| <b>Q3.<br/>(20 Marks)</b> | <b>Solve any Two Questions out of Three (10 marks each).</b>                                                                                                                                                             |
| A                         | Determine the total pressure and centre of pressure on a plane rectangular surface of 1 m wide and 3 m deep when its upper edge is horizontal and (a) coincides with water surface (b) 2 m below the free water surface. |
| B                         | Derive Euler's equation of motion in cartesian coordinate system.                                                                                                                                                        |
| C                         | A two-dimensional flow field is given by $\phi = 3xy$ , determine: (i) The stream function. (ii) The velocity at L(2, 6) and M (6,6) and the pressure difference between the points L and M.                             |