INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad -500 043
CIVIL ENGINEERING
ASSIGNMENT

| Course Name | $:$ | FLUID MECHANICS |
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| Course Code | $:$ | A30101 |
| Class | $:$ | II B. Tech I Semester |
| Branch | $:$ | CIVIL Engineering |
| Year | $:$ | $2016-2017$ |
| Course Faculty | $:$ | Anand Reddy G, Assistant Professor, Civil Engineering |

## OBJECTIVES:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

| S. No | Question | Blooms Taxonomy Level | Course Outcome |
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| ASSIGNMENT-I |  |  |  |
| 1 | a) Differentiate between U-tube and Inverted U-Tube differential manometers. <br> b) As shown in fig, pipe $M$ contains carbon tetrachloride of specific gravity 1.594 under a pressure of $1.05 \mathrm{Kgf} / \mathrm{cm}^{2}$ and pipe N contains oil of specific gravity 0.8 . If the pressure in the pipe N is $1.75 \mathrm{Kgf} / \mathrm{cm}^{2}$ and the manometric fluid is mercury. Determine the difference ' X ' between the levels of mercury. | Comprehension, Application | 1,3 |
| 2 | a) Explain the terms surface tension and vapor pressure. <br> b) A 40 mm diameter shaft is rotating at 200 rpm in a bearing of length 120 mm . if the thickness of oil film is 1.5 mm and dynamic viscosity of oil is $0.7 \mathrm{Ns} / \mathrm{m}^{2}$. Determine i) torque required to overcome friction in bearing, ii) power utilized in overcoming viscous resistance. | Comprehension, Application | 1,3 |


| 3 | a) <br> b) | Define and state the applications of momentum equation. A $45^{\circ}$ reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40 cm and 20 cm respectively. Find the force exerted by water on the bend, if the intensity of the pressure at inlet of bend is $21.58 \mathrm{~N} / \mathrm{cm}^{2}$. The rate of flow of water is 500 liters per second. | ApplicationKn owledge | 2 |
| :---: | :---: | :---: | :---: | :---: |
| 4 | a) | Derive continuity an expression for continuity equation in three dimensional flow. <br> The water is flowing through a pipe having diameters 20 cm and 15 cm at sections 1 and 2 respectively. The rate of flow through pipe is 40 $\mathrm{ltr} / \mathrm{s}$. the section 1 is 6 m above datum line and section 2 is 3 m above the datum. If the pressure at section 1 is $29.43 \mathrm{~N} / \mathrm{cm}^{2}$, Calculate the intensity of pressure at section 2. | Analysis | 2 |
| 5 | a) b) | Define displacement thickness, momentum thickness and energy thickness. Calculate the displacement thickness, momentum thickness for the velocity distribution in the boundary layer given by $\mathrm{u} / \mathrm{U}=2(\mathrm{y} / \delta)-\left(\frac{y}{\delta}\right)$ | Knowledge, Application | 6 |
| ASSIGNMENT-II |  |  |  |  |
| 1 | a) <br> b) | Explain the working of a reciprocating pump with a neat sketch. A double acting reciprocating pump running at 40 rpm is discharging 1 $\mathrm{m}^{3}$ of water per minute. The pump has a stroke of 400 mm . the diameter of the piston is 200 mm . the delivery and suction heads are 20 m and 5 m respectively. Determine the slip of the pump and the power required to drive the pump. | Application, Comprehension | 5 |
| 2 |  | A trapezoidal channel 2 m wide at the bottom and 1 m deep has side slopes $1: 1$. Determine :the totoal pressure and the centre pressure on the vertical gate closing the channel when it is full of water. <br> For a two-dimensional flow $\Phi=3 x y$ and $x=3 / 2\left(y^{2}-x^{2}\right)$. Determine the velocity components at the points $(1,3)$ and $(3,3)$. Also find the discharge passing between the streamlines passing through the points given above. | Application, Analysis | 5 |
| 3 | a) <br> b) | Define the following; <br> i. Unit speed <br> ii. Unit discharge <br> iii. Unit power <br> iv. Degree of reaction <br> A Pelton wheel having a mean bucket diameter of 1.0 m is running at 1000 r.p.m. the side clearance angle is 150 and discharge through the nozzle is $0.1 \mathrm{~m}^{3} / \mathrm{s}$, determine power available at the nozzle and hydraulic efficiency of the turbine. | Application, Knowledge | 4 |
| 4 |  | Explain the principle of venturimeter with a neat sketch.derive the expression rate of flow of fluid through it. <br> What are the boundary conditions that must be satisfied by a given velocity profile in laminar boundary layer flows. | Synthesis, Application | 4 |


| 5 | a)Derive an expression for loss of head due to sudden contraction of a <br> pipe. <br> A horizontal pipe line 40 m long is connected to a water tank at one <br> end and discharges freely into the atmosphere at the other end. For the <br> first 25 m of its length from the tank is 150 mm diameter and its <br> diameter is suddenly enlarged to 300 mm . The height of water level in <br> the tank is 8 m above the centre of the pipe. Considering all losses of <br> head which occur, determine the rate of flow. Take $\mathrm{f}=0.01$ for both <br> sections of the pipe, also draw HGL and TEL. | Synthesis, <br> Application | 2 |
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