B.Tech II Year II Semester (R09) Supplementary Examinations May/June 2016

FLUID MECHANICS \& HYDRAULIC MACHINERY
(Mechanical Engineering)
Time: 3 hours
Max. Marks: 70

## Answer any FIVE questions <br> All questions carry equal marks

1 (a) Find out the differential reading 'h' of an inverted U-tube manometer containing oil of specific gravity 0.7 as the manometric fluid when connected across pipes $A$ and $B$ as shown in the following figure, conveying liquids of specific gravities 1.2 and 1.0 and immiscible with manometric fluid. Pipes A and B are located at the same level and assume the pressures at $A$ and $B$ to be equal.

(b) Define viscosity. What is Newton's law of viscosity?

2 (a) What is Bernoulli's equation? Also list the assumptions.
(b) What are rotational and irrotational flows? Also give the rotational components in $\mathrm{x}, \mathrm{y}$ and z directions.

3 (a) Explain Reynold's experiment.
(b) Starting from first principles obtain the following expression for discharge of a liquid through a venturimeter $Q=K C \sqrt{h}$ where Q is discharge in $\mathrm{m}^{3} / \mathrm{s}, \mathrm{K}$ is the discharge coefficient of the venturimeter and h is venturi head in meters of fluid flowing through the venturimeter.

4 A jet of water 80 mm diameter and having a velocity of $20 \mathrm{~m} / \mathrm{s}$ impinges at the centre of hemispherical vane. The linear velocity of vane is $10 \mathrm{~m} / \mathrm{s}$ in the direction of jet. Find the force exerted on the vane. How this force would change if the jet impinges on a series of vanes attached to the circumference of wheel?

5 What are the various elements of hydro electric power station? Explain in detail.
6 A single jet Pelton wheel runs at $300 \mathrm{r} . \mathrm{p} . \mathrm{m}$ under a head of 510 m . The jet diameter is 200 mm , its deflection inside the bucket is $165^{\circ}$ and its relative velocity is reduced by $15 \%$ due to friction. Find water power, resultant force on the bucket and overall efficiency. Take mechanical losses $=3 \%$, coefficient of velocity $=0.98$ and speed ratio $=0.46$.

7 (a) What is meant by governing of turbines? Also give the procedure for governing of turbines.
(b) In a hydroelectric station water is available at the rate of $175 \mathrm{~m}^{3} / \mathrm{s}$ under a head of 18 m . The turbines run at a speed of 150 r.p.m with overall efficiency of $82 \%$. Find the number of turbines required if they have the maximum specific speed of 460 .

