(3) TE-sem-V - old - Mechanical. - FM

23/5/16

QP Code : 29222

(3 Hours) **[Total Marks : 100**

N. B. :

1. **Question no.1 is compulsory.**
2. Attempt any **FOUR** from question no. 2 to 7.
3. Use illustrative diagrams wherever required.

Q. No.			Marks
Q1)		Attempt **ANY FOUR**	
	a)	State and explain Newton's Law of Viscosity.	05
	b)	Draw a neat sketch of Pitot Tube. Explain its working principle.	05
	c)	Derive basic hydrostatic equation.	05
	d)	Define velocity potential function and stream function.	05
	e)	Define aerofoil and Explain lift and drag on aerofoil.	05
Q2)	a)	For steady incompressible flow verify if the following equations of velocity components are possible: (i) $u = 4xy + y^2$ ii) $v = 6xy + 3x$ iii) $u = 2x^2 + y^2$ iv) $v = -4xy$ Also check if the flow is irrotational and hence determine the potential function if it exists.	10
	b)	A tank section is made of half circle of 1m diameter. Find out the total pressure acting on this half circle tank if it is filled with water.	10
Q3)	a)	Starting from Navier stoke equation for incompressible laminar flow; derive an equation for velocity profile of Couette flow.	10
	b)	Derive Darcy's equation for head lost in pipe flows. State your assumptions clearly.	10
Q4)	a)	A simple U tube manometer is used to measure the vacuum pressure of the liquid flowing through a pipe. One end of the manometer is connected to the centre of the pipe and other end is open to atmosphere. The difference in mercury level in the two limbs is 30 cm and the height of the liquid in the limb connected to pipe is 20 cm from the centre of the pipe. Find the pressure in the pipe. Assume specific gravity of the liquid flowing through pipe as 0.85.	10
	b)	Write short notes on i. Moody's diagram ii. Buoyancy and Archimedes's Principle	10

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Q. No.			Marks
Q5)	a)	Explain Reynold's Transport Theorem with its proof.	10
	b)	Explain the concept of boundary layer. Define boundary layer thickness, displacement thickness, momentum thickness, energy thickness.	10
Q6)	a)	A tornado may be assumed to be large irrotational vortex. If the peripheral velocity and pressure at a point 60m from the centre are 150km/hr and 100 kPa. Find the peripheral speed and pressure at a point 100m from the centre. Take mass density of air 1.2 kg/m^3.	10
	b)	Explain i. Lagrangian approach ii. Finite Volume Method of analysis in CFD	10
Q7	a)	i. State and explain one seventh power law	05
		ii. Write a note on Prandtl's mixing length theory	05
	b)	300 litres/sec of water is flowing in a pipe. The pipe is bent by 120^0. The pipe bend measures 260 mm x 240 mm and volume at the bend is 0.14m^3. The pressure at the entrance is 73 KN/m^2 and exit is 2.4 m above the entrance section. Find the resultant force and the direction on the bend.	10