S.E. (SEM. IV) (CBSGS) (MECHANICAL ENGG.) 30th Nov. 2015

FLUID MECHANICS **QP Code : 5347**

(3 Hours) **[Total Marks : 80**

N. B. :

1. **Question no.1 is compulsory.**
2. Attempt any **THREE** from question no. 2 to 6.
3. Use illustrative diagrams wherever required.

Q. No.			Marks
Q1)		Attempt **ANY FOUR**	
	a)	Define a fluid and distinguish between ideal and real fluids	**05**
	b)	A stone weights 245N in air and 168N in water. Calculate the volume and specific gravity	**05**
	c)	Explain Hydrostatic law	**05**
	d)	Define stream lines, path lines and streak lines	**05**
	e)	Define Mach number, stagnation density and stagnation temperature	**05**
Q2)	**a)**	The velocity components in two dimensional flow field are as follows $u = y^3/3 + 2x - x^2y$, $v = xy^2 - 2y - x^3/3$	**10**
		i. whether the flow is possible	
		ii. obtain an expression for stream function	
		iii. obtain an expression for potential function	
	b)	A sliding gate 3m and 1.5m high situated in a vertical plane has a coefficient of friction between itself and guide of 0.18. if the gate weight is 19n and its upper edge is at a depth of 9m , what vertical force is required to raise it? Neglect buoyancy force on gate.	**10**
Q3)	**a)**	Starting from the Navier Stokes equation for an incompressible Newtonian fluid derive Bernoulli's equation stating the assumptions	**10**
	b)	Derive the expression for stagnation density and stagnation temperature.	**10**
Q4)	**a)**	A pipeline of length 2400m is used for power transmission. If 115kW power is to be transmitted through the pipe in which water having a pressure of 500 N/cm^2 at inlet is flowing? Find the diameter of the pipe and efficiency of transmission if the pressure drop over the length of pipe is 100 N/cm^2. Take f = 0.026. also find diameter if pipe corresponding to maximum efficiency of transmission	**10**
	b)	write short note on	**10**
		i. Moody's diagram	
		ii. Major and minor losses	

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Q. No.			Marks
Q5)	a)	A normal shock wave occurs in a duct in which air is flowing at a Mach number of 1.5. The static pressure and temperature upstream of the shock wave is 1.5 bar and 270°C. Determine pressure, temperature and mach number downstream of the shock. Also calculate strength of shock	10
	b)	Explain Prandlts mixing length theory	10
Q6)	a)	The velocity profile within a laminar boundary layer over a flat plate is given by the equation $u/U = 2(y/\delta) - (y/\delta)^2$ Where U is the mean stream velocity and δ is the boundary layer thickness . Determine the displacement thickness and momentum thickness	10
	b)	Explain i. Aerofoil theory ii. Reynolds Transportation theorem	10