Sanjay Ghodawat University, Kolhapur 2019-20
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Year and Program: 2019-20 **School of Technology** **Department: Aeronautical Engineering**
S Y B. Tech.
Course Code: AET207 **Course Title: Fluid Mechanics** **Semester – III**
Day and Date: Friday 22/11/19 **End Semester Examination (ESE)** **Time: 9m Max Marks: 100** 10.30 am to 1.30 pm.

Instructions:
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.

			Marks	Bloom's Level	CO
Q.1	a)	Define mass density, specific gravity, viscosity, compressibility, surface tension and capillarity.	06	L_2	CO1
		OR			
	a)	State and prove hydrostatic law.	06	L_2	CO2
	b)	Explain the following terms:	06	L_2	CO1
		i) Rotational flow and irrotational flow.			
		ii) Uniform flow and non-uniform flow.			
		iii) Steady flow and unsteady flow.			
		OR			
	b)	Discuss various flow measuring devices.	06	L_2	CO1
Q.2	a)	Discuss the velocity distribution and shear stress distribution of a viscus fluid flowing between two parallel plates.	06	L_2	CO3
		OR			
	a)	Explain major losses and minor losses in flow through pipe.	06	L_2	CO3
	b)	Explain streamline body and bluff body.	06	L_2	CO3
		OR			
	b)	List the methods to control the boundary layer separation.	06	L_2	CO1
Q.3		**Solve any Two**	08	L_3	CO2
	a)	Calculate the capillary rise or capillary fall in mm in a glass tube of 4 mm diameter, when immersed in i) water ii) mercury. Take density of water as 998 kg/m^3, surface tension of water and mercury in contact with air as 0.073575 N/m and 0.51 N/m respectively and angle of contact for water as zero and that for mercury as 130^0.			
	b)	A 300 mm diameter pipe conveying water, branches into two pipes of diameters 200 mm and 150 mm respectively. If the average velocity in the 300 mm diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 150 mm diameter pipe, if	08	L_3	CO2

the average velocity in the 200 mm diameter pipe is 2 m/s.

	c)	There is horizontal crack 40 mm wide and 2.5 mm deep in a wall of thickness 100 mm. Water leaks through the crack. Find the rate of leakage of water through the crack if the difference of pressure between the two ends of the crack is 0.03×10^{-4} N/mm^2. Take the viscosity of water as 0.001 Ns/m^2.	08	L_3	CO2
	d)	The pressure difference (Δp) for viscous flow in a pipe depends on diameter of pipe (D), length of pipe (L), The velocity (V), viscosity (μ) and density (ρ). Using Buckingham's theorem obtains an expression for Δp.	08	L_3	CO4
Q.4		**Solve any Two**			
	a)	Explain different types of drag. Obtain expression for drag and Lift.	09	L_2	CO3
	b)	Experiments were conducted in a wind tunnel with a wind speed of 50 km/h on a plate of size 2 m long x 1 m wide. The density of air is 1.15 kg/m^3. If the coefficient of lift and drag are 0.75 and 0.15 respectively, determine i) lift force ii) drag force iii) resultant force, iv) direction of resultant force and v) power exerted by the air on the plate.	09	L_3	CO3
	c)	A flat plate 2 m x 2 m moves at 50 km/h in a stationary air of density 1.15 kg/m3. If the coefficient of lift and drag are 0.75 and 0.15 respectively. Determine i) lift force ii) drag force iii) resultant force iv) the direction of resultant force and v) power required to keep the plate in motion.	09	L_3	CO1
Q.5		**Solve any Two**			
	a)	Define pump. Give the classification of pumps. Explain the working principle of centrifugal pump.	09	L_2	CO5
	b)	Explain the working principle of Pelton wheel with a neat sketch.	09	L_2	CO5
	c)	A pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 LPS under a head of 30 m. The buckets deflect the jet through an angle of 160°. Calculate the power given by the water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as. 0.98.	09	L_3	CO5
Q.6		**Solve any Three**			
	a)	Explain the working principle of Kaplan turbine with a neat sketch.	08	L_2	CO5
	b)	Explain the procedure to construct velocity triangle.	08	L_2	CO5
	c)	A kite 0.8 m x 0.8 m weighing 3.924 N assumes an angle of 12 degree to the horizontal. The string attached to the kite makes an angle of 45 degree to the horizontal. The pull on the string is 24.525 N when the wind is flowing at a speed of 30 KMPH. Find the coefficient of drag and lift. Density of air is given as 1.25 kg/m^3.	08	L_3	CO4

ESE

d)	A man weighing 981 N descends to the ground from an aeroplane with the help of a parachute against the resistance of air. The shape of the parachute is hemispherical and the velocity of the parachute with which it comes down is 20 m/s. Determine the diameter of the parachute. Assume Cd = 0.5 and density of air = 0.00125 gm/cc.	08	L_3	CO4
e)	The internal and external diameters of the impeller of a centrifugal pump are 250 mm and 500 mm respectively. The pump is running at 1000 rpm. The vane angle of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water.	08	L_3	CO5

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