Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: CE206

Course Name: FLUID MECHANICS II

Max. Marks: 100 Duration: 3 Hours

Assume any missing data suitably.

PART A

Answer any two full questions, each carries 15 marks.

			Marks
1	a)	A Pelton wheel working under a head of 800 m develops 15 MW running at 600 rpm with an overall efficiency of 85%. The ratio of wheel diameter to jet diameter is 15, the coefficient of velocity for the nozzle is 0.97 and the speed ratio is 0.46. Determine the rate of flow, diameter of wheel and number of jets.	(8)
	b)	A jet of water having a velocity of 40 m/s strikes a curved vane, which is moving with a velocity of 20 m/s. The jet makes an angle of 30^0 with the direction of motion of vane at inlet and leaves at an angle of 90^0 to the direction of motion of vane at outlet. Determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock.	(7)
2	a)	A Francis turbine is running at 400 rpm when head available is 60 m. The inner and outer diameters are 50 cm and 100 cm respectively. The constant velocity of flow through the runner is 10 m/s and hydraulic efficiency is 80%. Determine the inlet and outlet runner blade angles.	(8)
	b)	What are the functions of a draft tube?	(4)
	c)	Define specific speed of a centrifugal pump.	(3)
3	a)	Define the terms: i) suction head, ii) delivery head, iii) static head, and iv) manometric head.	(4)
	b)	Why priming is necessary in centrifugal pumps?	(2)
	c)	The impeller of a centrifugal pump has an external diameter of 300 mm and internal diameter of 150 mm and it runs at 1200 rpm. The vanes at exit are set back at an angle of 30°. If the velocity of flow is constant at 2 m/s, determine: i) the blade angle at the inlet, ii) the velocity and direction of water at outlet and iii) the head developed if manometric efficiency is 0.85.	(9)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	Derive Chezy's equation for uniform flow in open channel.	(7)
	b)	It is required to convey 10 m^3/s of water at a mean velocity of 1.25 m/s. Calculate the dimensions of the most efficient section of the channel whose shape is a) rectangular and b) trapezoidal channel of side slope $1/\sqrt{3}$	(8)

5 a) Draw and explain the specific energy curve. (7)

b) In a hydraulic jump occurring in a rectangular horizontal channel the discharge per unit width is 2.5 m^2/s and the depth before the jump is 0.25 m. Estimate the sequent depth and the energy loss. (8)

6 a) Define the terms: i) alternate depths, ii) Normal Slope and iii) Hydraulic mean depth. (5)

b) A rectangular channel 2.5 m wide has a specific energy of 1.50 m when carrying a discharge of 6.48 m^3/s. Calculate the alternate depths and corresponding Froude numbers. (10)

PART C

Answer any two full questions, each carries 20 marks.

7 a) Sketch the water surface profiles that can occur in a mild slope channel. (8)

b) A wide rectangular channel of width 12 m conveys water at a normal depth of 1.8 m, the bed slope being 1 in 1800. Due to an obstruction in the form of an overflow dam the water level near the obstruction rises by 1 m. Find the slope of the water surface near the obstruction with respect to horizontal. Take Manning's coefficient as 0.025. (12)

8 a) State Buckingham π theorem. (3)

b) Explain the different types of similarity that must exist between a prototype and its model. (7)

c) The variables controlling the motion of a floating vessel through water are the drag force F, the speed V, the length L, the density ρ , dynamic viscosity μ of water and acceleration due to gravity g. Derive an expression for drag force F by dimensional analysis. (10)

9 a) A 1: 10 model of a channel is made for the purpose of studying wave motion. Find the scale ratios for (i) velocity, (ii) time and (iii) acceleration. If in the model a wave takes 5 second to travel a distance, find the time taken for the wave in the prototype to describe the corresponding distance. (8)

b) Differentiate between distorted model and undistorted model with examples. (6)

c) State the assumptions made in the derivation of the dynamic equation for gradually varied flow (6)