Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

VI SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2018

SUBJECT: HYDRAULICS AND HYDRAULIC MACHINES [CIE 4007]

REVISED CREDIT SYSTEM

(24/ 04/ 2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data may be suitable assumed.

Q.No		Marks	CO
1A.	A wide rectangular channel carries a flow of 2.76 m^3/sec/m width, the depth of flow being 1.524m (a) Calculate the minimum rise in the floor at a section required to produce critical flow conditions (b) What is the corresponding fall in the water level?	**03**	**CO1**
1B.	Explain the energy- momentum principle as applied to open channel flow with a neat sketch and obtain the general momentum equation	**03**	**CO1**
1C.	Water is discharged in a rectangular channel 1.2m wide by passing under a sluice so that the flow is 0.85m/sec and the depth is 0.6m. Determine the variation of depth (dy/dx) if the slope of the channel bed is (i) 1 in 1000 (ii) 1 in 700 (iii) 1 in 500. Assume Chezy's C= 57	**04**	**CO1**
2A.	If in a hydraulic jump occurring in a horizontal rectangular channel, the Froude number before the jump is 10.0 and the energy loss is 3.0m. Estimate the sequent depths, discharge and the Froude number after the jump.	**03**	**CO2**
2B.	What is regime channel? Explain initial, final and permanent regime conditions as applied to design of stable channels.	**02**	**CO3**
2C.	State the assumptions (any 4 points) made in the derivation of the dynamic equation for gradually varied flow. In the form of a table give neat sketches of GVF profiles of mild and steep sloped channels.	**05**	**CO1**
3A.	Explain the following characteristics of jump in a rectangular channel a) Pressure distribution b) Velocity profile	**04**	**CO2**
3B.	Elaborate the step by step working proportions of Pelton wheel.	**03**	**CO4**
3C.	Design an irrigation channel by Kennedy's theory to carry a discharge of 15cumec with critical velocity ratio =1, Manning's n=0.0225and bed slope =1 in 5000.	**03**	**CO3**
4A.	Show that, for maximum efficiency in a jet striking at the centre of moving curved vane, the vane velocity should be equal to one third of the jet velocity	**02**	**CO4**

Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent institution of MAHE, Manipal)

4B.	A square metal plate 200mm x 200mm x 10mm is hung so that it can swing freely about the upper horizontal edge. A horizontal jet of water 20mm diameter impinges with its axis perpendicular and 50mm below the edge of the hinge and keeps it steadily inclined at 30° to the vertical. Find the velocity of the jet if the specific weight of the metal is $75.54xl0^3 N/m^3$	**04**	**CO4**
4C.	A Pelton wheel develops 5000kW power under a head of 225m at an overall efficiency of 85%, when rotating at a speed of 200 rpm. Find the unit discharge, unit power and unit speed. If the head of the turbine falls to 120m during summer season; find the speed, discharge and power for this head.	**04**	**CO4**
5A.	Distinguish between centrifugal pump and reciprocating pump (6 points)	**03**	**CO5**
5B.	A centrifugal pump has an impeller 0.5m outer diameter and when running at 600rpm discharges water at the rate of 8000 Ipm against a head of 8.5m. The water enters the impeller without whirl and shock. The inner diameter is 0.25m and the vanes are set back at outlet at an angle of 45° and the area of flow is constant from inlet and outlet of the impeller and is $0.06m^2$. Draw the velocity triangles at inlet and outlet. Determine (i) The manometric efficiency of the pump (ii) the vane angle at the inlet.	**04**	**CO5**
5C.	Explain the various pat1S of a centrifugal pump with the help of a neat diagram.	**03**	**CO5**