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Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2018

CE3CO10 Hydraulics and Hydraulic Machines

Programme: B.Tech. Branch/Specialisation: CE

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated.Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. If Reynolds number is more than $5*10^5$ the boundary layer is called **1**

(a) Laminar boundary layer (b) Turbulent boundary layer

(c) Either of the above (d) None of the above

ii. On account of which of the following boundary layer exists? **1**

(a) Surface tension (b) Gravitational force

(c) Viscosity of fluid (d) None of the above

iii. Hydraulic depth is defined as **1**

(a) (P/A) (b) (A/P) (c)(A/T) (d) (P/T)

iv. Velocity of flow at any channel section is **1**

(a) Uniformly distributed. (b) Non-Uniformly Distributed

(c) Linear in nature. (d) None of these

v. Steep slope results when **1**

(a) Bottom slope is less than critical slope.

(b) Bottom slope is more than critical slope.

(c) Bottom slope is equal to critical slope.

(d)Bottom slope equals to zero.

vi. Assumption used in Gradually varied flow **1**

(a) Channel is prismatic

(b) Energy correction factor is unity

(c) Pressure distribution is hydrostatic

(d) All of these

vii. Which of the following is not a type is hydraulic jump **1**

(a) Strong Jump (b) Oscillating Jump

(c) Rotating Jump (d) Undular Jump.

P.T.O.

viii. Steady jump occur when **1**
(a) Fr is between 1.0 to 1.7 (b) Fr is between 4.5 to 9.0
(c) Fr is equals to 9.0 (d) Does not depend on Fr.

ix. Francis turbine is a type of **1**
(a) Mixed flow turbine (b) Radial flow turbine
(c) Tangential flow turbine (d) All of these

x. Priming is done in order to **1**
(a) Run the pump satisfactorily
(b) Remove air from impeller and casing
(c) Completely fill the impeller and casing by water
(d) All of these

Q.2 i. What do you understand by Laminar Sublayer? **2**

ii. Write down the factors influencing boundary layer thickness along a flat smooth plate. (Any 3) **3**

iii. Explain in brief the concept of boundary layer separation along with diagram. **5**

OR iv. What are the different methods for controlling separation of boundary layer? Explain in brief. **5**

Q.3 i. Write any four differences between Pipe Flow and Open Channel Flow? **3**

ii. A most efficient trapezoidal section is required to give a maximum discharge of 21.5m^3/s of water. The slope of the channel bottom is 1 in 2500. Taking C = 70 in Chezy's equation, determine the dimensions of the channel. Also determine the value of Manning's n, taking the value of velocity of flow as obtained for the channel by Chezy's equation. **7**

OR iii. Derive the expressions of all the conditions for most economical Trapezoidal section. **7**

Q.4 i. Write down the classification and characteristics of surface profiles. **4**

ii. Derive the expressions for critical depth, critical velocity and minimum specific energy for rectangular channel section. **6**

OR iii. What do you understand by Gradually varied flow? Also derive the dynamic equation for G.V.F. **6**

Q.5 i. Differentiate between positive and negative surge. **4**

ii. (a) Explain the concept of Hydraulic Jump. **6**

(b) A trapezoidal channel having bottom width of 8 m and side slope 1:1 carries a discharge of 80 m^3/s. Find the depth conjugate to initial depth of 0.75 m before the jump. Also determine the loss of energy in the jump.

OR iii. Derive the expression for height of hydraulic jump and loss of energy in a hydraulic jumpformed in a rectangular channel. **6**

Q.6 Attempt any two:

i. Explain the main components and working of a reciprocating pump with diagram. **5**

ii. Explain the components and working of Centrifugal pump with neat diagrams. **5**

iii. Explain the components and working of Kaplan turbine with neat diagram. **5**

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Marking Scheme
CE3CO10 Hydraulics and Hydraulic Machines

Q.1	i.	If Reynolds number is more than $5*10^5$ the boundary layer is called (b) Turbulent boundary layer	**1**
	ii.	On account of which of the following boundary layer exists? (c) Viscosity of fluid	**1**
	iii.	Hydraulic depth is defined as (c)(A/T)	**1**
	iv.	Velocity of flow at any channel section is (b) Non-Uniformly Distributed	**1**
	v.	Steep slope results when (b) Bottom slope is more than critical slope.	**1**
	vi.	Assumption used in Gradually varied flow (d) All of these	**1**
	vii.	Which of the following is not a type is hydraulic jump (c) Rotating Jump	**1**
	viii.	Steady jump occur when (b) Fr is between 4.5 to 9.0	**1**
	ix.	Francis turbine is a type of (a) Mixed flow turbine	**1**
	x.	Priming is done in order to (d) All of these	**1**
Q.2	i.	Definition of Laminar Sublayer?	**2**
	ii.	Factors influencing boundary layer thickness along a flat smooth plate. Any 3factors 1 mark for each (1 mark *3)	**3**
	iii.	Concept of boundary layer separation Description 3 marks Diagram. 2 marks	**5**
OR	iv.	Any three methods for controlling separation of boundary layer	**5**
Q.3	i.	Any four differences between Pipe Flow and Open Channel Flow 0.75 mark for each difference (0.75 mark *4)	**3**
	ii.	Also determine the value of Manning's n, taking the value of velocity of flow as obtained for the channel by Chezy's equation.	**7**
OR	iii.	Expressions of all the conditions for most economical Trapezoidal section For description 2 marks For diagram 1 mark For derivation. 5 marks	**7**
Q.4	i.	Write down the classification and characteristics of surface profiles. 1 mark for each profile (1 mark *4)	**4**
	ii.	Expressions for critical depth, critical velocity and minimum specific energy for rectangular channel section. 2 marks for each expression (1 mark *3)	**6**
OR	iii.	For definition 2 marks For mathematical expression 1 mark For derivation 3 marks	**6**
Q.5	i.	Differentiate between positive and negative surge. 1 mark for each difference (1 mark * 4)	**4**
	ii.	(a) Explain the concept of Hydraulic Jump. 2 marks (b) The loss of energy in the jump. 4 marks	**6**
OR	iii.	Expression for height of hydraulic jump 3 marks Expression of loss of energy 3 marks	**6**
Q.6		Attempt any two:	
	i.	Reciprocating pump with neat diagrams For components 2 marks For diagram 1 mark For working. 2 marks	**5**
	ii.	Centrifugal pump with neat diagrams. For components 2 marks For diagram 1 mark For working. 2 marks	**5**
	iii.	Kaplan turbine with neat diagram. For components 2 marks For diagram 1 mark For working. 2 marks	**5**

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