PAPER ID-421650

Subject Code: **RCE401**

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM IV) THEORY EXAMINATION 2021-22
HYDRAULICS & HYDRAULIC MACHINES

Time: 3 Hours ***Total Marks: 70***

Notes:

- *Attempt all Sections and Assume any missing data.*
- *Appropriate marks are allotted to each question, answer accordingly.*

SECTION-A	Attempt **All** of the following Questions in brief	Marks **(7X2=14)**
Q1(a)	Define Rigid channel.	
Q1(b)	Give the classification of flow through open channel.	
Q1(c)	Write the condition of streaming flow.	
Q1(d)	With neat sketch define Undular jump.	
Q1(e)	Write the components of a centrifugal pump.	
Q1(f)	What is reaction turbines?	
Q1(g)	Draw neat sketches of characteristic curve of turbine.	

SECTION-B	Attempt **ANY THREE** of the following Questions	Marks **(3X7=21)**
Q2(a)	Differentiate between open channel flow and pipe flow.	
Q2(b)	A rectangular channel of 4 m is discharging 80m^3/s of water . Determine the critical depth and critical velocity of water flowing through the channel.	
Q2(c)	What do you understand by wave and write the types of waves?	
Q2(d)	A single-acting reciprocating pump, running at 50 r.p.m. , delivers 0.01 m^3/s of water . The diameter of the piston of the piston is 200 mm and stroke length 400 mm. Determine the (i) Theoretical discharge of the pump (ii) Co-efficient of discharge (iii) slip and the percentage slip of the pump.	
Q2(e)	What is a hydraulic intensifier ? Explain its working and principle.	

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X7=7)**
Q3(a)	Water is flowing in a channel of width 3 m with side slopes 1:1 , if the discharge through the channel is 4 m^3/s and depth of flow is 1.4 m , find the specific energy of water.	
Q3(b)	Calculate the critical depth of a triangular channel whose vertex angle of 12^0.	

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X7=7)**
Q4(a)	Using concept of specific energy , obtain for flow at a constant specific energy in rectangular channel , where q_c is the critical discharge $\frac{q}{q_c} = \sqrt{3\left(\frac{d}{d_c}\right)^2 - 2\left(\frac{d}{d_c}\right)^3}$	
Q4(b)	The base width of a trapezoidal section is 6 m and side slopes are 2H : 1V. The depth of water is 2.5 m . Find the discharge through the channel using Chezy's constant C=50. Take the bed slope of the channel 1 in 1000.	

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X7=7)**
Q5(a)	Find the forces in x and y directions when jet strikes at the curved plate at one end tangentially when the plate is symmetrical.	
Q5(b)	Find the expression for depth of hydraulic jump in terms of upstream Froude number.	

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X7=7)**
Q6(a)	Differentiate between a single acting pump and double –acting reciprocating pump.	
Q6(b)	A centrifugal pump delivers water against a net head of 14.5 m and a design speed 1000 r.p.m. The vanes are curved back an angle of 30^0 with the periphery . The impeller diameter is 300 mm and outlet width is 50 mm. determine the discharge of the pump if	

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	manometric efficiency is 95%.

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X7=7)**
Q7(a)	Two jet strike the buckets of a pelton wheel , which having shaft power as 15450 kW. The diameter of each jet is given as 200 mm. If the net head on the turbine is 400m. Find overall efficiency of the turbine , Take $C_v = 1.0$.	
Q7(b)	Describe briefly the functions of various main components of Pelton turbine with neat sketches	