Total No. of Questions – [3]

Total No. of Printed Pages: 02

G.R. No.	

PAPER CODE	U222-222 (ESE)

May 2022 (ENDSEM) EXAM

S.Y. B. TECH. (SEMESTER - II)-CIVIL ENGINEERING

COURSE NAME: HYDRAULIC ENGINEERING

COURSE CODE: CVUA22202

(PATTERN 2020)

Time: [1Hr] [Max. Marks: 30]

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **'a' part of every question is compulsory**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1 a) Derive the dynamic equation of gradually varying flow in the following form. [4]

$\frac{dy}{dx} = \frac{S_0 - S_1}{1-(F_r)^2}$.

b) A rectangular channel 20 m wide flow with normal depth of 2m with a slope of bed 1 in 6400. At a certain section, the flow depth is 3m. How far upstream or downstream of this section will the depth be 2.6m. Use step method and take only two steps. Take Manning's coefficient = 0.015. Sketch & mention the profile [6]

OR

b) A rectangular channel 15 m wide carries water with normal depth of 3 m. The end slope of the channel is 1 in 3600. If the water level is to be raised to 4 m above the channel bed by constructing a weir across the channel.

Determine how far upstream of this section the depth of flow will be 10% of normal depth. Use step by step method and take only 2 steps. Take Manning's as 0.015. Classify and sketch the profile. [6]

Q2 a) Derive the expression of force and work done by the impact of jet on a moving curved vane when the jet is striking at the center of the vane [4]

b) A 20 cm diameter jet of water having a velocity of 12 m/s strikes a stationary flat plate at an angle of 30° to the normal. Calculate the force exerted by the jet on the plate (a) in the direction normal to the plate (b) in the direction of the plate [6]

OR

b) A centrifugal pump rotating at 1800 rpm delivers 0.4 m3/s under a head of 16 m. Calculate the specific speed of the pump and the power input. Assume overall efficiency of the pump as 0.7. If this pump was to operate at 900 rpm what would be head, discharge and power required for homologous conditions? Assume overall efficiency unchanged at new rpm. [6]

Q.3 a) Draw schematic sketch of a Pelton wheel turbine and explain functions of Nozzle, runner and buckets and braking jet [4]

b) A Pelton wheel turbine is to operate under a net head of 500 m at 420 rpm. If a single jet with diameter 18 cm is used find the specific speed of the machine. Cv= 0.98, speed ratio=0.45, overall efficiency of turbine is 85% [6]

OR

b) A Pelton wheel working under a head of 350m develops 15000 kW. The speed of the turbine is 450rpm and the jet ratio is 1/10 and speed ratio 0.45. The overall efficiency of turbine is 80%. Determine: Diameter of wheel, Diameter of jet, Discharge of turbine, Number of jets. Assume coefficient of velocity = 0.98 [6]