**18CE404**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **August, 2021** | **Civil Engineering** | | |
| **Fourth Semester** | **Hydraulics and Hydraulic Machines** | | |
| **Time:** Three Hours | | **Maximum: 5**0 Marks | |
| *Answer Question No. 1 Compulsorily.* | | | (10X1 = 10 Marks) |
| *Answer* ***ANY ONE*** *question from each Unit.* | | | (4X10=40 Marks) |

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| 1. | a) | What is specific energy? | CO1 | |  |
|  | b) | Define alternate depths of open channel flow. | CO1 | |  |
|  | c) | Write the dynamic equation of GVF. | CO2 | |  |
|  | d) | What is hydraulic jump? | CO2 | |  |
|  | e) | Write the expression for force exerted by jet of water along the jet direction when it is striking a fixed curved vane at its center. | CO3 | |  |
|  | f) | What is Impulse Turbine? | CO3 | |  |
|  | g) | What are the conditions for getting maximum efficiency in radial flow turbines? | CO3 | |  |
|  | h) | How to determine the number of π- terms required according to Buckingham’s π-theorem? | CO4 | |  |
|  | i) | Define the specific speed of a Centrifugal pump. | CO4 | |  |
|  | j) | What is priming? | CO4 | |  |
| **Unit - I** | | | | | |
| 2. | a) | Derive the conditions for most economical trapezoidal channel section. | CO1 | **5M** | |
|  | b) | A lined channel (n = 0.014) is of trapezoidal section with side slopes 1.5 H: 1V. If the channel is to deliver 9.0 m3/sec., when laid on a slope of 0.0002, calculate the dimension of the efficient section which requires minimum lining. Also calculate the corresponding mean velocity. | CO1 | **5M** | |
|  |  | **(OR)** |  |  | |
| 3. | a) | Define critical flow and derive the condition for critical flow in open channel. | CO1 | **5M** | |
|  | b) | In a rectangular channel of bed width 5 m with a bed slope of 0.0001, uniform flow is taking place with a normal depth of 1.5 m. Calculate the specific energy of flow assuming Chezy’s constant as 40. Also find the minimum specific energy required for the flow and corresponding critical depth. | CO1 | **5M** | |
| **Unit – II** | | | | | |
| 4. | a) | Explain classification of channel bottom slopes for GVF in open channels. | CO2 | **5M** | |
|  | b) | GVF is taking place in a rectangular channel of bed with 5 m at a rate of 10 m3/s. At a particular section, the depth of flow is 1.5 m. Find the slope of water surface elevation if the channel is laid at a slope of 0.0001. Take Manning’s n as 0.012. | CO2 | **5M** | |
|  |  | **(OR)** |  |  | |
| 5. | a) | Draw and Name the water surface profiles for the following cases. (i) Mild slope followed by a steep slope (ii) steep slope followed by a steeper slope. | CO2 | **5M** | |
|  | b) | Derive the equation for loss of energy due to hydraulic jump. | CO2 | **5M** | |
| **Unit – III** | | | | | |
| 6. | a) | Show that the efficiency of a free jet striking normally as series of flat plates mounted on the periphery of a wheel never exceeds 50%. | CO3 | **5M** | |
|  | b) | A jet of water of the diameter 100 mm moving with a velocity of 20m/s strikes a curved fixed plate tangentially at one end at an angle of 300 to Horizontal. The jet leaves the plate at an angle of 200 to the Horizontal. Find the force exerted by the jet on the plate in horizontal direction. | CO3 | **5M** | |
|  |  | **(OR)** |  |  | |
| 7. | a) | Explain the terms specific speed, unit speed, unit power and unit discharge as applied to hydraulic turbines. | CO3 | **5M** | |
|  | b) | Design a pelton wheel for a head of 80 m and speed 300 r.p.m. The wheel develops 103 kW shaft Power. Take Cv= 0.98, speed ratio = 0.45 and overall efficiency is 80%. | CO3 | **5M** | |
| **Unit – IV** | | | | | |
| 8. | a) | Explain various dimensionless numbers and their importance in hydraulic similarities. | CO4 | **5M** | |
|  | b) | Explain the Backingham π-theorem and mention repeating variables. | CO4 | **5M** | |
|  |  | **(OR)** |  |  | |
| 9. | a) | Draw and explain workin g principle of centrifugal pump with neat sketch. | CO4 | **5M** | |
|  | b) | Explain the multistage centrifugal pump with impellers in parallel and series with neat sketch. | CO4 | **5M** | |

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