**II B. Tech I Semester Regular Examinations, March - 2021**
**FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS**
(Agricultural Engineering)

Time: 3 hours                                                   Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1. a) A U-tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipe line. Its left end is connected to the pipe and the right limb is open to the atmosphere. The centre of the pipe is open to the atmosphere. The centre of the pipe is 100mm below the level of mercury (specific gravity=13.6) in the right limb. If the difference of mercury level in the two limbs is 160mm, determine the absolute pressure of the oil in the pipe [8M]

   b) Define surface tension. Derive the expression for the pressure inside a droplet and hallow bubble of liquid in excess of outside pressure. [7M]

Or

2. A circular plate 3 meter diameter is submerged in water in such a way that its greatest and least depth below the free surface are 4m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure [15M]

3. a) Derive the Bernoulli's equation for one dimensional flow along a stream line [8M]

   b) What are the different methods of preventing the separation of boundary layers [7M]

Or

4. A 2m long pipeline tapers uniformly from 10cm diameter to 20cm diameter at its upper end. The Pipe centre line slopes upwards at an angle of $30^0$ to the horizontal and the flow direction is from smaller to bigger cross section. If the pressure gauges installed at the lower and the upper ends of the pipe line read 200KPa and 230KPa respectively, determine the flow rate and the fluid pressure at the mid length of the pipe line. Assume no energy losses. [15M]

5. a) Derive the expression for the discharge through a triangular notch [10M]

   b) State the advantages of triangular notch over the rectangular notch [5M]

Or

6. a) Define velocity of approach. How does the velocity of approach affect the discharge over a weir [7M]

   b) A rectangular notch 50 cm long is used for measuring a discharge of 40 liters per second. An error of 2 mm was made in measuring the head over the notch. Calculate the percentage error in the discharge. Take Cd= 0.6 [8M]

7. A horizontal pipe line 40m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300mm.The height of water level in the tank is 8m above the centre of the pipe. Considering all losses of head which occur, determine the rate of flow. Take f=0.01 for both sections of the pipe. [15M]

Or

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8    Three pipes of 40cm diameter and 300m long , 20cm in diameter and 40m long    [15M]
     pipe and 30cm diameter and 200 m long pipe are connected in series and the ends
     are connected to two tanks  whose water level difference is 20 m. find out the
     discharge through the compound pipe.
     Considering only friction losses (b) frictional and all other minor losses. Take f=
     0.005 for all pipes

9    The depth of flow of water at a certain section of a rectangular channel of 5 m    [15M]
     wide is 0.6 m. The discharge through the channel is 15 $m^3$/s. If the hydraulic jump
     takes place on the downstream side, Find the depth of flow after the jump

Or

10   Derive an expression for the variation of depth along the length of the bed of the    [15M]
     channel for gradually varied flow in an open channel. State clearly all the
     assumptions made

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