

*Note: All questions are compulsory. Marks are indicated against each question in square brackets.*

- [1]. Show that for a very wide rectangular channel, if the bed slope ' $S_b$ ' is determined using Manning's formula, the classification of surface profile as mild or steep is determined in accordance with its value being less than or greater than

$$\frac{n^2 g^{1/3}}{2 q^2} \quad \text{CO2, CO3 [5]}$$

- [2]. The gradually varied flow is generally studied in terms of 'differential' and 'dynamic' equations. The dynamic equation can be written in terms of Froude' Number. Derive the basic expression for dynamic equation of GVF and its final form in terms of Froude number. Also, determine the 'Conveyance' and 'Section Factor' using Manning's Equation.

CO3 [5]

- [3]. A rectangular channel with bottom width of 4.0 m and a bottom slope of 0.0008 has a discharge of 150 m<sup>3</sup>/sec. In a gradually varied flow in this channel, the depth at a certain location is found to be 0.30 m. Assuming  $n = 0.016$ , determine the type of GVF profile.

CO2, CO3 [5]

- [4]. In a rectangular channel 3.5 m wide laid at a slope of 0.0036, uniform flow occurs at a depth of 2 m. Find how high can the hump be raised without causing a flux? If the upstream

depth of flow is to be raised to 2.5 m. what should be the height of the hump? Take Manning's 'n' equal to 0.015. CO2, CO3 [5]

[5]. A trapezoidal channel has a bottom width of 6 m and side slopes of 2 horizontal to 1 vertical. If the depth of flow is 1.2 m at a discharge of  $10 \text{ m}^3/\text{s}$ . compute the specific energy and critical depth. CO2 [5]