No. of Printed Pages : **4**

ET-540(B)

00283

B.Tech. Civil (Construction Management)

Term-End Examination

December, 2012

ET-540(B) : FLOW IN OPEN CHANNEL

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any five** questions. All questions carry **equal** marks. Give neat and well-labelled sketches.*

1. (a) With reference to open channel flow explain the terms : **8**

(i) Steady and unsteady flow

(ii) Uniform and non - uniform flow

(iii) Rapidly varied and gradually varied flow

(b) Is unsteady, gradually varied flow possible ? Explain. **2**

(c) Why is hydraulic grade line placed above the conduct in pipe flow ? Where does this line lie in an open channel flow ? Draw the sketches. **4**

2. (a) In a trapezoidal channel (b = 2.5 m) with z = 2, has a bed slope of 0.0013 and n = 0.014. For a normal discharge of 65 m^3/s, find its normal depth, by trial and error method. 9

(b) A rectangular channel, 4.25 m wide, with n = 0.015, has $Y_n = 0.98$ m for a $Q = 9$ m^3/s. Find the bed slope. 5

3. (a) Describe how specific energy curves are constructed, and point out its important features. 8

(b) If for a given depth of flow in a channel, the discharge is increased (maintaining the depth constant) what will happen to the value of specific energy compared to the earlier value. Explain it with the help of E - Y curves. 3

(c) How will the depth (as said in (b)) remain same even for the increased discharge ? 3

4. (a) Explain what is understood by a specific force curve. 5

(b) Explain how the formation of a jump is interpreted by using specific energy and specific force curves. 9

5. (a) Show, for a gradually varied flow : 6

$$\frac{dy}{dx} = \frac{S_o - S_f}{1 - \alpha F^2}$$

Explain the symbols used here in, with the help of a diagram.

(b) For a wide rectangular channel show : 4

$$1 - \left(\frac{Z_c}{Z}\right)^2 - 1 - \left(\frac{Y_c}{Y}\right)^3$$

(c) Prove, $Q = Z_c \left(g/\alpha\right)^{1/2}$, in any open channel. 4

[Note : The symbols in (b) and (c) have their usual meanings.]

6. Discuss the flow characteristics of a very long channel that connects two reservoirs. Assume the flow to be sub - critical with the water level of the upstream reservoir remaining constant. Explain in detail. 14

7. Outline the procedure for locating a hydraulic jump in a mild - sloped channel. 14

8. A trapezoidal channel, with $b = 5.5$ m, $z = 1.5$, $S_0 = 0.0015$, $n = 0.022$, carries a flow of 9.5 m^3/s. A small dam stands at a certain location on the channel. The held up flow gives a depth of 1.5 m just behind the dam. Taking $\alpha = 1$, compute the distance (from the dam) at which the depth of flow is 1.3 m, upstream of the dam. Carry out the computation in one step only ; and give the calculations in the proper tabular form. **14**