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B.Tech. Civil (Water Resources Engineering)

Term-End Examination

December, 2011

ET-533(B) : OPEN CHANNEL FLOW

Time : 3 hours   *Maximum Marks : 70*

Note :   *Answer **any five** questions. All questions carry equal marks. Neat, and well-labelled sketches are to be given where necessary. Use of scientific calculator is permitted.*

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1. (a) Sketch the hydrostatic pressure distribution   6
         in an open channel whose bed is
         (i) concave upwards ; (ii) convex upwards.
         Give reasons.

    (b) Give typical velocity distribution profile in   6
         an open channel (prismatic) along a
         vertical ; and along a horizontal. Give
         reasons.

    (c) What is the distinctive difference between   2
         an open channel and a pipe flow ?

2. (a) A rectangular channel (b = 1.55m) is to carry   6
         a given flow at critical condition, at a depth
         of flow = 0.78m. Find the critical velocity
         of flow. Also, find the critical slope if
         n = 0.014. What is the value of discharge ?

    (b) Solve :   6
         above if the Froude No of flow = 0.72.

    (c) Draw typical isovels for a rectangular and   2
         a trapezoidal channel.

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3. (a) Explain the steps for development of : **6**
   (i) Specific energy curve, and

   (ii) Specific force curve.

   (b) Explain how we use the concept of specific **6**
   force in the hydraulic jump predictions.

   (c) How do we designate a given prismatic **2**
   channel as steep, mild, or critical.

4. Giving sketches explain the various gradually, **14**
   varied flow water surface profiles that can occur
   in nature. State the practical conditions under
   which each curve comes into existence.

5. Sketch out, and explain the layout of one USBR **14**
   energy dissipator set up down stream of a
   spillway. Give the function of each element.

6. (a) While a flood was being passed off by **7**
   a spillway, at a discharge intensity
   of 8.25 m^2/s, it was observed that the
   depth of flow on the horizontal floor
   was = 0.65 m. Calculate the required
   tailwater depth to cause the formation of a
   hydraulic jump.

   (b) Calculate the loss of energy through this **5**
   jump.

   (c) Name the type of jump that is formed **2**
   here ?

7. Discuss in detail *any two* methods of computing **14**
   gradually varied water surface profiles. Give the
   format of the tables used to enter the results of
   calculations.

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8. Write short notes on *any four* of the following : 4x3.5=14

   (a) Surge wave and its types, giving sketches.

   (b) Estimation of the length of hydraulic jump

   (c) Reynolds Number

   (d) Factors influencing Manning's coefficient. $'n'$

   (e) Estimation of wave height in the design of a gravity dam.

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