

# KERALA AGRICULTURAL UNIVERSITY

B.Tech. (Agrl. Engg.) 2009 Admission  
VI<sup>th</sup> Semester Final Examination, July /August 2012

Cat. No: Lwre.3206

Title:-Soil and water conservation structures (2+1)

Marks: 80  
Time: 3hours

I) Fill up the blanks with suitable words.

10x1=10

1. Open channel flow is said to be uniform if the depth of flow is \_\_\_\_\_ at every section of the channel.
2. Down stream section of a structure that discharges the flow into the gully down stream is called \_\_\_\_\_.
3. In open channel, at critical state of flow the specific force is \_\_\_\_\_ for the given discharge.
4. In spillway structures cut-off walls are constructed to provide structural strength against \_\_\_\_\_.
5. The hydraulic jump is said to be a steady jump when the Froude number remains within \_\_\_\_\_ to \_\_\_\_\_.
6. \_\_\_\_\_ spillways are constructed along the gully bed.
7. Vertical distance between designed water elevation and the elevation of embankment top is called as \_\_\_\_\_.
8. Embankment type farm ponds are generally constructed across the \_\_\_\_\_.
9. \_\_\_\_\_ type earth fill dam is made of more than one fill materials.
10. For an embankment height of 5m, the top width should be \_\_\_\_\_ m.

II) Write answers on ANY TEN

10x3=30

(Take suitable assumptions wherever necessary)

1. Differentiate between free flow and submerged flow conditions with suitable diagrams.
2. Explain aeration of weirs.
3. How will you assess the environmental impact of soil and water conservation structures in a watershed?
4. Explain the creep line theory taking one drop spillway structure.
5. Classify the soil erosion control structures and sketch and show different parts of those structures.
6. Explain the momentum principle in open channel flow conditions.
7. Draw one earthen embankment and show different components and write their functions.
8. What are the variables those affect equivalent fluid pressure on a drop structure and how to determine that?
9. Determine the height of wing wall of a drop structure, if net drop from top of transverse sill to crest is 2.5m, head over crest is 1.5m and

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height of transverse sill is 0.5m.

- 10. How will you determine the saturation line for a specific flow condition in case of a drop structure?
- 11. Write notes on brushwood check dams with their functions.
- 12. How will you test safety against sliding, over turning, crushing and tension in a drop spillway?

III) Answer ANY SIX of the following:

6x5=30

(Take suitable assumptions wherever necessary)

- 1. Show the different parts of a drop spillway with a figure and write down functional use, advantages and disadvantages of a straight drop spillway.
- 2. What do you mean by hydraulic jump? Discuss the different types of hydraulic jumps and its application.
- 3. What are the different types of farm ponds? Explain the design of farm pond in details.
- 4. Design an earthen embankment of 18m height.
- 5. Define specific energy and derive the criterion for a critical state of flow in open channel.
- 6. Determine the size of concrete pipe needed in a drop inlet spillway for a peak discharge of 3cumec and a total head of 3.5m. Determine the slope to be given to the pipe for the pipe to flow full if length of pipe is 15m, entrance loss coefficient 0.5 and friction loss coefficient 0.03.
- 7. What is percolation pond? Give the design procedure of percolation pond.
- 8. Explain triangular load diagram for various flow conditions in hydraulic structures.

IV) Answer ANY ONE (Take suitable assumptions wherever necessary)

1x10=10

- 1. A straight drop spillway is proposed to be constructed in a gully for controlling the erosion. The bed slope of gully is 5%. The spillway is to be equipped with rectangular weir with crest height of 2.5m above the gully bed. Calculate
  - a) Length of weir
  - b) Free board required for handling the peak discharge rate of 8cumec such that specific energy is limited to 1.25m
  - c) The actual head acting on the weir, when cross sectional area of water flow in the gully at 4.5m distance towards u/s is 7.5m<sup>2</sup>
  - d) Maximum discharge handled by the weir if wave action is taken into consideration
- 2. Discuss different types of small earth embankments. List down the design criteria of earthen dam and discuss design of earthen dam in detail with all protective measures.