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**University Examinations 2015/2016**

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR THE DIPLOMA IN CIVIL ENGINEERING

**ECV 2303: ENGINEERING HYDRAULICS I.**

**DATE: AUGUST 2016 TIME: 11/2 HOURS**

**INSTRUCTIONS: -** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Define the following
2. Hydraulic mean depth (1 mark)
3. Wetted perimeter (1 mark)
4. Open channel flow (1 mark)
5. Conduit (1 mark)
6. Breach (1 mark)
7. Abutment (1 mark)
8. Briefly discuss the difference between the following
9. Steady uniform flow and steady non-uniform flow (2 marks)
10. Dam and reservoir (2 marks)
11. Primary spillway and auxiliary spillway (2 marks)
12. For a pipe of diameter $d$ running full with a fluid of density, velocity , kinematic viscosity  and hydraulic mean depth $m$, show that the Reynolds number, $Re$ is given by: (3 marks)

$Re$=

1. State five ways in which water may pass from a reservoir to the downstream side of a dam. (5 marks)
2. State six ways in which dam failure is likely to occur. (6 marks)
3. State four main components of a hydraulic power plant (4 marks)

**QUESTION TWO (15 MARKS)**

1. An open channel has a cross-section in the form of a trapezium with a bottom width B of 4m and side slopes of 1 vertical and 11/2 horizontal as shown below. Assuming that the roughness coefficient n is 0.038, the bed slope is 1 in 1600 and the depth of the water is 1.2m. find the volume rate of flow using;
2. The Chezy formula with C determined from the Kutter formula. (5 marks)
3. The manning formula (3 marks)

From the Kutter formula,

Take 

1. For the cross-section given in the figure below, . If the equation for maximum discharge is given by 

Determine the following:

1. Hydraulic mean depth in terms of depth D (3 marks)
2. Depth D when discharge, and  in the Chezy’s formula (4 marks)

**QUESTION THREE (15 MARKS)**

1. Define the following as applied in the design of dams and reservoirs
2. Toe (1 mark)
3. Core (1 mark)
4. Drawdown (1 mark)
5. Blanket (1 mark)
6. Cutoff (1 mark)
7. Using well labelled diagram, illustrate the structural features of the following
8. Embankment dam (5 marks)
9. Arch dam (5 marks)

**QUESTION FOUR (15 MARKS)**

1. Define hydraulic turbine (1 mark)
2. Briefly describe the following classes of turbines
3. Impulse turbine (2 marks)
4. Reaction turbine (2 marks)
5. State the difference between volumetric efficiency and mechanical efficiency as applied in the study of hydraulic turbines. (2 marks)
6. State two functional differences between reaction turbines and impulse turbines. (2 marks)
7. Name any three main components of a typical Francis turbine and state their functions. (6 marks)