KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2010/2011

INSTITUTIONAL BASED PROGRAMME (IBP) DECEMBER SESSION

EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SMA 533: FLUID MECHANICS II

DATE: WEDNESDAY 27TH APRIL 2011 TIME: 9.00 A.M -12.00 NOON

INSTRUCTIONS: Answer Question ONE and any other TWO.

QUESTION ONE

(a) State four differences between open channel and pipe flow. (8 marks)

(b) Define the following terms

(i) Depth of flow section

(ii) Top width

(iii) Welted circa

(iv) Welted perimeter

(v) Hydraulic radius (1 marks x 5)

(c) A triangular gulter, whose sides include an angle of 60^{o} conveys water at a uniform depth of 300 mm. If the discharge is $0.08\, m^3 ls$, determine the gradient of trough. Use Chezy's formula assuming that C= 52. (9 marks)

(d) (i) Define dimensional analysis and state 3 of its advantage. (5 marks)

(ii) Determine the dimensions Kimatic viscosity. (3 marks)

QUESTION TWO (20 MARKS)

(a) Discuss the most economic section of (i) A channel , hence show that a rectangular channel will be most economical when the depth pf flow is equal to half the base width any hydraulic radius equal to half the depth of flow. (14 marks)

(ii) A rectangular channel is to be dug in the rock portion of a soil. Find its most economic cross- section if it is to convey 24 m^3ls of water with an average velocity of 6 m^3ls^o take Chezy's Combtat C= 50 . (6 marks)

QUESTION THREE (20 MARKS)

(a) (i) Define dimensional homogeneity. (2 marks)

(ii) State three uses of dimensional homogeneity. (3 marks)

(b) The resistance $\Re$ of a supersonic plane during flight can be considered as depilate upon the length of the aircraft, velocity v , air viscosity μ air density ρ and modulus of air K. Express the functional relationship between these variables and the resisting force. Explain the physical meaning of the dimensionless group. (15 marks)

QUESTION FOUR (20 MARKS)

(a) (i) State three advantages of model testings. (3 marks)

(ii) Differentiate between Kinematics similenty and Dynamics similarity (2marks)

(iii) Discuss two forces influencing Hydraulic phenomena . (3 marks)

(iv) S hip 300m long A 1: 100 model of this ship is tested in a wind tunnel. The velocity of air in the wind tunnel around is 60N . Determine the velocity of ship in sea – water and also resistance of the ship in sea water. The density of air is given as 1.24 kg/ m^3. Take the Kimatic Viscosity of sea-water and air as 0.012 x 10^{-4} m^2ls and 0.018 x 10^{-4} m^2/s respectively. (6 marks)

(b) Discuss most economical trapezoidal channel section. (6 marks)

QUESTION FIVE (20 MARKS)

(a) Define the following (i) line source (2 marks)

(ii) link sink (2 marks)

(b) Discuss the complex velocity potential dual to a line source and a line sink.(6 marks)

(c) State and outline the proof of Blasius theorem. (10 marks)

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