FACULTY: ENGINEERING

DEPARTMENT: CIVIL ENGINEERING

SEMESTER I EXAMINATIONS (MARCH 2017)

2016/2017 ACADEMIC SESSION

COURSE CODE: CVE 403

COURSE TITLE: DRAINAGE & IRRIGATION ENGINEERING

DURATION: 2.5 Hours

HOD'S SIGNATURE

INSTRUCTIONS:

1. ANSWER FOUR QUESTIONS

2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM

(1*a*) Calculate the the peak discharge from a high school having the following surfaces:

Parking lot, asphaltic 11150m^2 (permeability factor p=0.85)

Building (roof) 10800m^2 (permeability factor p=0.85)

Lawns, heavy soil and 2% slope 35000m^2 (permeability factor p=0.15)

Lawns, heavy soil and 6% slope 105050m^2 (permeability factor p=0.21)

Use the following hydrological data assuming an average time of concentration of 53 min and an average rainfall intensity (6marks) of 34mm/hr where $Q = \frac{C_{av}iA}{360} = 0.00278CiA$, $Q = Total\ runoff\ or\ design\ flow$

C_{av} = *Average runoff coefficient for the area*, i = rainfall intensity (mm/hr), A = Total area of watershed (ha)

p = *permeability factor*

$$\left(Average\ runoff\ coefficient\ C_{av} = \frac{\sum(a_n \times p_n)}{A_{total}} \right)$$

(1*b*) A new housing estate is to be drained by a separate storm sewer network. The estate is rectangular in plan 1200m by 900m and will consist of approximately 30% paved and 10 % roofed surfaces. Determine maximum discharge capacity given a rainfal intensity of 26mm/hr. (6 marks)

Paved surface, asphaltic 30% (1200×900)m^2 (permeability factor p=0.85)

Building (roof) 10% (1200×900)m^2 (permeability factor p=0.85)

The rest of the area (60%) is made up of grass surface with the same permeability factor

(2*a*) What is canal headworks and what role does it play in irrigation systems? (4 marks)

(*b*) Draw and explain the functions of weirs and barage found in a diversion scheme headworks (8 marks)

(3) The base period, duty of water and area under irrigation for various crops under a canal irrigation system are given in the table below. If the losses in the reservoir and canals are 15% and 25 % respectively, determine the reservoir capacity (12 marks)

Crops	Wheat	Sugar	Cotton	Rice	Vegetables
Base period B (*days*)	120	320	180	120	120
Duty, D (*ha/cumec*)	1800	1600	1500	800	700
Area irrigated, (*ha*)	15000	10000	5000	7500	5000

(4) Design a lined irrigation canal having the following data using a trapezoidal section: (12 marks)

Full supply discharge $= 200$ *cumec* (m^3s^{-1})

Side slope = 1.25:1

Bed slope = 1 in 5000

Rugosity coefficient $N = 0.018$

Permissible velocity = $1.75ms^{-1}$

Use design data from the table below

Design parameters	Side slope		
	1:1	1.5:1	1.25:1
Sectional area (A)	BD+1.785 D^2	BD+2.088 D^2	BD+1.925 D^2
Wetted perimeter (P)	B+3.570D	B+4.176D	B+3.85D

(5) Design the most economical trapezoidal section of an irrigation canal on a non-alluvial soil shown below having the following data: (12 marks)

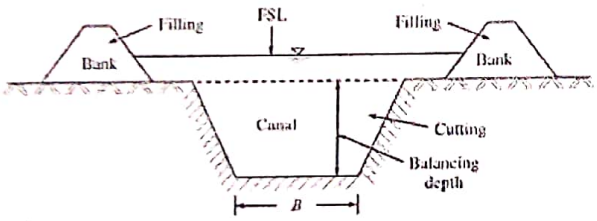
Discharge of the canal = 20 *cumec* (m^3s^{-1})

Permissible mean velocity = 0.85 ms^{-1}

Bazin's constant $K = 1.30$

Side slope of canal $= 1\frac{1}{2}:1$ (H:V)

In addition, determine the allowable bed slope of the canal



(6) Design a rectangular channel to drain out the whole water collected in the area indicated below in 2 hrs. Assume a longitudinalslope of 1 in 4000, roughness coefficient (N) of 0.001 and the velocity of the flow not to exceed $1ms^{-1}$. Assume necessary data (12 marks)

Contour (*m*)	198.0	198.5	199.0	199.5	200.0
Area (m^2)	1750	2200	15900	19000	21000