SEMESTER 7TH

GROUP ID	Roll no.
C-1	101,106,111,116,121,126,131,136,141,146,151,201,206,211, 216,221,226,231,236,241,246,251,301,306,311,316,321,326, 331,336,341,346,351
C-2	102,107,112,117,122,127,132,137,142,147,152,202,207,212, 217,222,227,232,237,242,247,302,307,312,317,322,327,332, 337,342,347,352
C-3	103,108,113,118,123,128,133,138,143,148,153,203,208,213, 218,223,228,233,238,243,248,303,308,313,318,323,328,333, 338,343,348
C-4	104,109,114,119,124,129,134,139,144,149,204,209,214,219, 224,229,234,239,244,249,304,309,314,319,324,329,334,339, 344,349
C-5	105,110,115,120,125,130,135,140,145,150,205,210,215,220, 225,230,235,240,245,250,305,310,315,320,325,330,335,340, 345,350

TUTORIAL – 1	**WATER REQUIREMENTS OF CROPS**

1. A field channel has a culturable commanded area of……hectares. The intensity of irrigation for gram is 30% and for wheat is 50%. For gram kor period is 16 days and kor depth is …… cm. For wheat kor period is 12 days and kor depth is…… cm. Calculate the discharge of the field channel required. T

GROUP ID	CCA	KOR DEPTH FOR GRAM	KOR DEPTH FOR WHEAT
C-1	3000	10	12
C-2	5100	12	10.5
C-3	3370	13.5	13.5
C-4	2250	10.5	12
C-5	4500	12	10

2. Find out the culturable command area that a tube well can command for a tube well discharge of 120 m^3 /hr. assuming 3200 hours of working per year consider intensity of irrigation 45% and the average depth required for the kharif crop 50 cm. L

3. A field canal has a culturable command area of 10^7 square meters. The crop X grown in the command area has an intensity of irrigation ……, kor period ……. days and kor depth…….. cm. Crop Y has intensity of irrigation……, kor period …….. days and kor depth …….. cm. Both crops X and Y are rabi crops sown on the same date. Calculate the design discharge of the field channel. T

GROUP ID	INTENSITY OF IRIGATION FOR X,Y	KOR DEPTH FOR X,Y (cm)	KOR PERIOD FOR X,Y (DAYS)
C-1	50,40	10,15	14,21
C-2	40,60	12,10	15,23
C-3	30,70	13.5,10	13,22
C-4	60,30	10,12	12,20
C-5	45,55	12,15	10,21

4. Details of cropping pattern of an irrigated command area are shown in the following table. Calculate the discharge required in feeding canal based on average demand of the crop water requirement. Also, calculate total storage required in the reservoir. Assume 15% conveyance losses in canals and 10% evaporation loss in the reservoir. T

(C-1, C-3)

Crop	Season	Base period (days)	Duty at field (Ha/cumec)	Crop area (Ha)
Rice	Kharif	120	1600	1500
Wheat	Rabi	120	850	1700
Sugar Cane	Perennial	360	900	1100

A canal takes off from a reservoir to irrigate the areas as shown in the Table below. 40% of the water required for irrigation is assumed to be available directly from precipitation. Channel conveyance losses are 15%. Reservoir losses are 10%. What would be the capacity of the reservoir needed? (The reservoir to be filled only once a year.)

(C-2, C-4)

crop	Base period (Days)	Duty at field (Ha/cumec)	Area under crop (Ha)
wheat	120	1800	500
Sugarcane	320	800	600
Rice	120	900	300
cotton	200	1400	1200

The following table provides the base period, duty and cultivated area for various crops, which are commanded by a canal off-taking from a reservoir. Determine the reservoir capacity, if losses in the canal and reservoir are 25% and 10% respectively.

(C-5)

CROP	BASE PERIOD (Day)	DUTY AT THE FIELD (ha/cumec)	AREA UNDER CULTIVATION (ha)
Sugarcane	330	1500	2500
Cotton	200	1400	3500
Wheat	120	1800	5000
Rice	120	900	2000
vegitables	120	1000	1500

TUTORIAL QUESTION	**1,3,4**

TUTORIAL - 2	**DIVERSION HEADWORKS**

1. Using Bligh's creep theory, calculate thickness of downstream floor at every 5m from the downstream end. Also check whether the floor length is sufficient. Use the following details: T
    a. Length of upstream floor = 20 m
    b. Length of downstream floor = 30 m
    c. Head on upstream side = 4 m
    d. Head on downstream side = 0 m
    e. Depth of upstream pile = 5 m
    f. Depth of downstream pile = 6 m
    g. Bligh's Creep coefficient, C = 18
    h. Weight density of concrete = 24 KN/m^3

2. A weir across an alluvial river has a horizontal floor of length 60m and remains 6 m of water under pond condition. If the downstream sheet pile is driver to a depth of 6 m below the average bed level, Calculate the exit gradient. Further assuming a porosity of 30% and the relative density of soil particles as 2.7, Estimate the critical hydraulic gradient and the factor of safety of the system with respect to exit gradient. T

3. Determine thickness of floor at 10m and 15m from u/s end if b = 28m, d_1 =5m, d_2 = 6m and H = 4 m. T

TUTORIAL QUESTIONS	1,2,3

TUTORIAL - 3	DISTRIBUTION WORKS

1. Design an irrigation canal to carry discharge of 5 cumecs. Take m =1.0, N = 0.0225 and B/D ratio = 4.40. L

2. Design a channel by Lacey's theory for 40 cumecs capacity. The side slopes may be 1:1. The average size of the bed material may be taken as 0.8mm. L

3. Design an irrigation channel in alluvial soil using Lacey's silt theory, given the following data:
   Full supply discharge = 12 m^3/sec (C-1, C-3)
   Lacey's silt factor = 1.0
   Channel side slopes = 0.5:1.

   Design an irrigation channel in alluvial soil using Lacey's theory, for the following data:
   (i) Full supply discharge = 10 cumec (C-2, C-4)
   (ii) Lacey's silt factor = 0.9
   (iii) Side slopes of channel = 0.5 (H):1 (V)

   Compare Lacey's and Kennedy's silt theory and design a channel in alluvial soil using Lacey's theory for Q=15m 3 sec, f=1.0 and slope 0.5:1. (C-5)

4. Design a channel for discharge of 50 cumecs in non-alluvial soil having maximum permissible velocity of 0.9 m/sec. The available bed slope is 1 in 4000. Assume Manning's N = 0.025. L

5. A lined canal with manning's n=0.012 is laid at a slop of 1:2000. It is required to carry flow of 30 cumecs. The side slops of canals are laid at 1V:2H. What will be the uniform flow depth in canal? Assume a triangular section with rounded circular bottom having radius equal to depth of flow. L

6. A trapezoidal irrigation canal with side slop 1.5 H to 1 V is proposed to be lined with bricks to reduce seepage losses. It is required to carry discharge of 120 m^3/s of water. Find the wetted perimeter for minimum amount of lining and required bed slope. The value of Manning's N is given as 0.015 and it is stipulated that average velocity cannot exceed 1 m/sec. (C-1, C-2)

Design a lined concrete channel, trapezoidal in section to carry a discharge of 200 cumec at a slope of 30cm/km. The Manning's N = 0.017, and side slopes are 1.5:1. The limiting velocity in the channel is 2m/s. (C-3, C-4)

Design a lined canal to carry 100 m3 /s on a slope of 1 in 2400.The maximum permissible velocity = 2 m/s, N= 0.013 in manning's formula, side slope =1.5H:1.0V (C-5)

TUTORIAL QUESTION	1,2,3,6

TUTORIAL – 4	STORAGE WORKS

1. A concrete gravity dam 6 m high is 1.5 m wide at top and 4.5 m at bottom with vertical water face. Determine the normal stress at toe the and at heel for reservoir empty and reservoir full conditions. Take unit weight of concrete = 23.5 kN/m^3 and c = 1. T

2. An earthen dam made of a homogeneous material has the following data:
   1) coefficient of permeability of dam material = 5×10^{-4}cm/s
   2) level of top of dam = 200 m
   3) level of deepest river bed = 178 m
   4) H.F.L. of reservoir = 197.5 m
   5) width of top of the dam = 4.5 m
   6) upstream slope = 3:1
   7) downstream slope = 2:1

   Determine the phreatic line for this dam section and the discharge passing through the Dam. T

TUTORIAL QUESTION	1,2