Course Code: 18CE0145 **R18**

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: Design & Drawing of Irrigation Structures (18CE0145)
Course & Branch: B.Tech& CE
Year & Sem: IV-B.Tech& I-Sem **Regulation:** R18

UNIT-I
DESIGN AND DRAWING OF SLOPING GLACIS WEIR

1	Design a sloping glacis weir with the following hydraulic particulars. U/S D/S Full supply discharge : 7.5 cumecs 7.5 cumecs Bed width : 6.0 m 6.0 m Bed level : + 10.00 + 8.00 F.S.D. (Full Supply Depth): 1.5 m 1.5 m F.S.L. : + 11.50 + 9.50 Top of Bank Level : + 12.50 + 10.50 Hard soil is available for foundations below + 8.00 level Draw the following: a) Plan b) Sectional Elevation	[L4][CO1]	**[60M]**
2	Design the sloping glacis weir across the stream for the following data: U/S D/S Full supply discharge : 7.0cumecs 7.0cumecs Bed width : 6.0 m 6.0 m Bed level : + 12.00 + 10.00 F.S.D. (Full Supply Depth) : 1.5 m 1.5 m F.S.L. : + 13.50 + 11.50 Top of Bank Level : + 14.50 + 12.50 Hard soil is available for foundations below + 10.00 level Draw the following: a) Plan b) Sectional Elevation	[L4][CO1]	**[60M]**
3	Design the sloping glacis weir across the stream for the following data: **Hydraulicparticulars** / **Up-streamof drop** / **Downstreamofdrop** Fullsupplydischarge / 9.0m^3/sec / 9.0m^3/sec Bedwidth / 6.5m / 6.5m Bedlevel / + 19.00 / + 17.00 Fullsupplydepth / 1.60m / 1.60m F.S.L / + 20.60 / + 18.60 Topofbanklevel(T.B.L) / + 21.60 / + 19.60 Hard strata is available below + 17.00 level for foundation. Draw the plan and sectional elevation to the suitable scale	[L4][CO1]	**[60M]**

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<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>Design the sloping glacis weir across the stream for the following data:
<table>
<tr><th>Hydraulicparticulars</th><th>Up-streamof drop</th><th>Downstreamofdrop</th></tr>
<tr><td>Fullsupplydischarge</td><td>7.5m^3/sec</td><td>7.5m^3/sec</td></tr>
<tr><td>Bedwidth</td><td>6.0m</td><td>6.0m</td></tr>
<tr><td>Bedlevel</td><td>+ 10.00</td><td>+ 8.00</td></tr>
<tr><td>Fullsupplydepth</td><td>1.50m</td><td>1.50m</td></tr>
<tr><td>F.S.L</td><td>+ 11.50</td><td>+ 9.50</td></tr>
<tr><td>Topofbanklevel(T.B.L)</td><td>+ 12.50</td><td>+ 10.50</td></tr>
</table>
Hard strata is available below + 8.00 level for foundation.
Draw the plan and sectional elevation to the suitable scale</td><td>[L4][CO1]</td><td>[60M]</td></tr>
<tr><td>5</td><td>Design the sloping glacis weir across the stream for the following data:
U/S D/S
Full supply discharge : 8.0cumecs 8.0cumecs
Bed width : 6.0 m 6.0 m
Bed level : + 12.00 + 10.00
F.S.D. (Full Supply Depth): 1.5 m 1.5 m
F.S.L. : + 13.50 + 11.50
Top of Bank Level : + 14.50 + 12.50
Hard soil is available for foundations below + 10.00 level
Draw the following:
a) Plan
b) Sectional Elevation</td><td>[L4][CO1]</td><td>[60M]</td></tr>
</table>

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UNIT-II
DESIGN AND DRAWING OF SURPLUS WEIR

1	Design a surplus weir for a minor tank forming a group of tanks with the following data: Combined catchment area = 25.89 km^2 Intercepted catchment area = 20.71 km^2 Top width of the bund = 2 m Side slopes of the bund = 2:1on both sides Top level of bund = +14.50 Maximum Water Level (MWL) = +12.75 Full Tank Level(FTL) = +12.00 General ground level at the site = +11.00 Ground level slopes offtoa level = +10.00 in about6 m distance The foundations are of hand gravel = +9.50 Saturation gradient = 4:1with1 m clean cover Provision is to be made to store water up to MWL in-times of necessity Draw the following: (a) Half plan at top and half plan at foundation level (b) Half longitudinal section and half longitudinal elevation	[L4][CO1]	**[60 M]**
2	Design a surplus weir for a minor tank forming a group of tanks with the following data: Combined catchment area = 35 km^2 Intercepted catchment area = 10 km^2 Top width of the bund = 2 m Side slopes of the bund = 2:1on both sides Top level of bund = +12.25 Maximum Water Level (MWL) = +10.75 Full Tank Level(FTL) = +10.00 General ground level at the site = +8.50 Ground level slopes off to a level = +8.00 in about6 m distance The foundation are of hand gravel = +7.00 Saturation gradient = 4:1with1 m clean cover Provision is to be made to store water up to MWL in-times of necessity Draw the following: (a) Half plan at top and half plan at foundation level (b) Half longitudinal section and half longitudinal elevation	[L4][CO1]	**[60 M]**
3	Designthesurplusworkofatankformingpartofachainoftanks.Thecombinedcatchment area of the group of tanks is 25.89 sq. kilometers and the area of the catchmentinterceptedbytheuppertanksis20.71sq. kilometers. It is decided to store water in the tank to a level of +11.00 meters above M.S.L. (Mean Sea Level) limiting the sub mersion of foreshore lands up toalevelof+11.75meters above M.S.L. The general ground level at the proposed site of work is +10.00 meters, and thegroundlevelbelowtheproposedsurplusslopesofftillitreaches+09.00metersinabout6metersdistance.	[L4][CO1]	**[60 M]**

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	Thetankbundhasatopwidthof2metersatlevel+13.50with2:1sideslopesoneitherside. The tank bunds are designed for a saturation gradient of 4:1 with 1 meter clear cover.Provisionmaybemadetomakekutcharegulatingarrangementstostorewaterupto M.W.L.attimesof necessity. The foundations are of hard gravel at a level of 8.50 meters near the site of work. Also draw the plan and longitudinal section.		
4	Design a surplus weir for a minor tank forming a group of tanks with the following data: Combined catchment area = 25.89 km^2 Intercepted catchment area = 20.71 km^2 Top width of the bund = 2 m Side slopes of the bund = 2:1on both sides Top level of bund = +14.50 Maximum Water Level (MWL) = +12.75 Full Tank Level(FTL) = +12.00 General ground level at the site = +11.00 Ground level slopes off toa level = +10.00 in about6 m distance The foundations areofhand gravel = +9.50 Saturationgradient = 4:1with1 m clean cover Provision is to be made to store water up to MWL in-times of necessity Draw the following: (a) Half plan at top and half plan at foundation level (b) Sectionacrossweir	[L4][CO1]	**[60 M]**
5	Design a surplus weir for a minor tank forming a group of tanks with the following data: Combined catchment area = 35 km^2 Intercepted catchment area = 10 km^2 Top width of the bund = 2 m Side slopes of the bund = 2:1on both sides Top level of bund = +12.25 Maximum Water Level (MWL) = +10.75 Full Tank Level(FTL) = +10.00 General ground level at the site = +8.50 Ground level slopes off to a level = +8.00 in about6 m distance The foundations are of hand gravel = +7.00 Saturation gradient = 4:1with1 m clean cover Provision is to be made to store water up to MW Lin-times of necessity Draw the following: (a) Half plan at top and half plan at foundation level (b) Section across weir	[L4][CO1]	**[60 M]**

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UNIT-III
DESIGN AND DRAWING OF TANK SLUICE WITH A TOWER HEAD

1	Design a tank sluice with tower head for the data given below: Ayacut to be irrigated = 200 ha Duty = 1000ha/cumec Top width of the tank bund = 2mwith 2:1 side slopes The top level of bank = +40.00 The ground level at the site = +34.50 Hard soil for foundation = +33.50 The sill of the sluice at off take = +34.00 The maximum water level in tank = +38.00 The Full Tank Level = +37.00 Average low water level of the tank = +35.00 The channel bed level = +34.00 Full supply level = +34.50 Bed width = 1.25 m Side slopes of channel = 1.5to 1 with top of bank at + 35.50 llowing: (a) Half plan at top & half plan at foundation level (b) Longitudinal section through the barrel	[L4][CO1]	**[60M]**
2	Design a tank sluice with tower head for the data given below: Ayacut to be irrigated = 200 ha Duty = 900ha/cumec Top width of the tank bund = 2mwith 2:1 side slopes The top level of bank = +140.00 The ground level at the site = +134.50 Hard soil for foundation = +133.50 The sill of the sluice at off take = +134.00 The maximum water level in tank = +138.00 The Full Tank Level = +137.00 Average low water level of the tank = +135.00 The channel bed level = +134.00 Full supply level = +134.50 Bed width = 1.25 m Side slopes of channel = 1.5to 1 with top of bank at +135.50 llowing: (a) Half plan at top & half plan at foundation level (b) Longitudinal section through the barrel	[L4][CO1]	**[60M]**
3	Design a tank sluice with tower head for the data given below: Ayacut to be irrigated = 400 ha Duty = 1000ha/cumec Top width of the tank bund = 3mwith 2:1 side slopes The top level of bank = +40.00 The ground level at the site = +34.50 Hard soil for foundation = +33.50 The sill of the sluice at off take = +34.00 The maximum water level in tank = +38.00 The Full Tank Level = +37.00	[L4] [CO1]	**[60M]**

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	Average low water level of the tank = +35.00 The channel bed level = +34.00 Full supply level = +34.50 Bed width = 1.25 m Side slopes of channel = 1.5to 1 with top of bankat + 35.50 llowing: (a) Half plan at top & half plan at foundation level (b) Longitudinal section through the barrel		
4	Design a sluice taking off from a tank irrigating 200 hectares at 1000ha/cumec duty. The tank bund through which the sluice is taking off has a top width of 2 meters with 2:1 side slopes. The top level of bank is +40.00 and the ground level at site is +34.50. Good hard soil for foundation is available at+33.50.The sill of the sluice at off-take is +34.00. The maximum water level in tank is +38.00. The full tank level is +37.00. Average low water level of the tank is +35.00. The details of the channel below the sluice are as under. Bed level +34.00 F.S.L. +34.50 Bed width 1.25meters Side slope 1.5 to1withtopof bankat+35.50. Also draw the plan and longitudinal section.	[L4][CO1]	**[60M]**
5	Design a tank sluice with tower head for the data given below: Discharge = 0.2cumec Top width of the tank bund = 2mwith 2:1 side slopes The top level of bank = +40.00 The ground level at the site = +34.50 Hard soil for foundation = +33.50 The sill of the sluice at off take = +34.00 The maximum water level in tank = +38.00 The Full Tank Level = +37.00 Average low water level of the tank = +35.00 The channel bed level = +34.00 Full supply level = +34.50 Bed width = 1.25 m Side slopes of channel = 1.5to 1 with top of bank at + 35.50 Draw the following: (a) Half plan at top & half plan at foundation level (b) Longitudinal section through the barrel	[L4][CO1]	**[60M]**

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UNIT –IV
DESIGN AND DRAWING OF TYPE – III SYPHON AQUEDUCT

1	Design a syphon aqueduct Type – III for the following data: **Canal:** Discharge = 35 m^3/s Bed width = 20.00 m Bed Level = +40.00 Full supply level = +42.00 Ultimate Bed level = +39.75 Ultimate full supply level = +42.50 Average velocity in the canal = 0.83m/s Left bank top width = 5.00 m Right bank top width = 2.00 m Canal side slopes both inside and outside = 2:1 Top of canal bank = +43.50 **Drain:** Catchment area = 8.0 km^2 Maximum computed discharge = 60 m^3/s Maximum flood level of the drain at the Site crossing = +39.75(observed) Average bed level of the drain at the site Crossing = +38.00 Hard soil is available at = +37.00 Draw the following: a) Half plan at top and half plan at foundation b) Section across syphon barrel	[L4][CO1]	**[60M]**
2	Design a syphon aqueduct Type – III for the following data: **Canal:** Discharge = 35 m^3/s Bed width = 20.00 m Bed Level = +40.00 Full supply level = +42.00 Ultimate Bed level = +39.75 Ultimate full supply level = +42.50 Average velocity in the canal = 0.83m/s Left bank top width = 5.00 m Right bank top width = 2.00 m Canal side slopes both inside and outside = 2:1 Top of canal bank = +43.50 **Drain:** Catchment area = 8.0 km^2 Maximum computed discharge = 60 m^3/s Maximum flood level of the drain at the Site crossing = +39.75(observed) Average bed level of the drain at the site Crossing = +38.00 Hard soil is available at = +37.00 Draw the following: a) Half plan at top and half plan at foundation b) Longitudinal section along barrel	[L4][CO1]	**[60M]**

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3	Design a syphon aqueduct Type – III for the following data: **<u>anal</u>:** Discharge = 35 m^3/s Bed width = 20.00 m Bed Level = +40.00 Full supply level = +42.00 Ultimate Bed level = +39.75 Ultimate full supply level = +42.50 Average velocity in the canal = 0.83m/s Left bank top width = 5.00 m Right bank top width = 2.00 m Canal side slopes both inside and outside = 2:1 Top of canal bank = +43.50 **<u>Drain:</u>** Catchment area = 8.0 km^2 Maximum computed discharge = 60 m^3/s Maximum flood level of the drain at the Site crossing = +39.75(observed) Average bed level of the drain at the site crossing = +38.00 Hard soil is available at = +37.00 <u>Draw the following:</u> a) Half plan at top and half plan at foundation b) Elevation from D/S drain and section through road arches	[L4][CO1]	**[60M]**
4	Design a syphon aqueduct Type – III for the following data: **<u>anal</u>:** Discharge = 36 m^3/s Bed width = 20.00 m Bed Level = +40.00 Full supply level = +42.00 Ultimate Bed level = +39.75 Ultimate full supply level = +42.50 Average velocity in the canal = 0.83m/s Left bank top width = 5.00 m Right bank top width = 2.00 m Canal side slopes both in side and outside = 2:1 Top of canal bank = +43.50 **<u>Drain:</u>** Catchment area = 8.0 km^2 Maximum computed discharge = 60 m^3/s Maximum flood level of the drain at the Site crossing = +39.75(observed) Average bed level of the drain at the site Crossing = +38.00 Hard soil is available at = +37.00 <u>Draw the following:</u> a) Half plan at top and half plan at foundation b) Section across syphon barrel	[L4][CO1]	**[60M]**

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5	Design a syphon aqueduct Type – III for the following data: **<u>Canal</u>:** Discharge = 36 m^3/s Bed width = 20.00 m Bed Level = +40.00 Full supply level = +42.00 Ultimate Bed level = +39.75 Ultimate full supply level = +42.50 Average velocity in the canal = 0.83m/s Left bank top width = 5.00 m Right bank top width = 2.00 m Canal side slopes both inside and outside = 2:1 Top of canal bank = +43.50 **<u>Drain:</u>** Catchment area = 8.0 km^2 Maximum computed discharge = 60 m^3/s Maximum flood level of the drain at the Site crossing = +39.75(observed) Average bed level of the drain at the site Crossing = +38.00 Hard soil is available at = +37.00 <u>Draw the following:</u> a) Half plan at top and half plan at foundation b) Longitudinal section along barrel	[L4][CO1]	**[60M]**

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UNIT –V
DESIGN AND DRAWING OF CANAL REGULATOR

1	Design a regulator cum road bridge with the following data: **Hydraulic particulars of canal upstream:** Full supply discharge : 20 m^3/s Bed width : 15 m Bed Level : + 20.00 Full Supply Depth : 2.0 m F.S.L. : + 22.00 Top level of bank : + 23.00 The right bank is 5 m wide and left bank is 2 m wide **Hydraulic particulars of canal downstream** : Full supply discharge : 16 m^3/s Bed width : 15 m Bed Level : + 20.00 Full Supply Depth : 1.75 m F.S.L. : + 21.75 Top Level of Bank : + 22.75 Good foundation soil is available at : + 19.00 The general ground level at site : + 22.00 Top width of banks are the same as those on the upstream side. The regulator carries a road way single lane designed for IRC loading class 'A' provide clear free board of one meter above F.S.L. for the road bridge. Also draw the plan and longitudinal section	[L4][CO1]	**[60M]**
2	Design a regulator cum road bridge with the following data : **Hydraulic particulars of canal upstream:** Full supply discharge : 18 m^3/s Bed width : 14 m Bed Level : + 15.00 Full Supply Depth : 2.0 m F.S.L. : + 17.00 Top level of bank : + 18.00 The right bank is 5 m wide and left bank is 2 m wide **Hydraulic particulars of canal downstream**: Full supply discharge : 12 m^3/s Bed width : 14 m Bed Level : + 15.00 Full Supply Depth : 1.60 m F.S.L. : + 16.60 Top Level of Bank : + 17.60 Good foundation soil is available at : + 14.00 The general ground level at site : + 17.00 Top width of banks are the same as those on the upstream side. The regulator carries a road way single lane designed for IRC loading class 'A' provide clear free board of one meter above F.S.L. for the road bridge.	[L4][CO1]	**[60M]**

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<table>
<tr><td>3</td><td>Design a regulator cum road bridge with the following data and draw half plan at foundation and longitudinal section
<table>
<tr><th>Hydraulic particulars</th><th>U/S canal</th><th>D/S canal</th></tr>
<tr><td>Full supply discharge</td><td>22 m^3/s</td><td>16 m^3/s</td></tr>
<tr><td>Bed width</td><td>15 m</td><td>15 m</td></tr>
<tr><td>Bed Level</td><td>+20.00</td><td>+20.00</td></tr>
<tr><td>Full Supply Depth</td><td>2 m</td><td>1.75 m</td></tr>
<tr><td>F.S.L</td><td>+22.00</td><td>+21.75</td></tr>
<tr><td>Top level of bank</td><td>+23.00</td><td>+22.75</td></tr>
</table>
Top width of banks is the same as those on the upstream side. The regulator carries a road way single lane designed for IRC loading class ‘A’ provides clear free board of one meter above F.S.L. for the road bridge.
The right bank is 5 m wide and left bank is 2 m wide on both U/S and D/S.Good foundation soil is available at + 19.00 m and ground level +22.00</td><td>[L4][CO1]</td><td>[60M]</td></tr>
<tr><td>4</td><td>Design a regulator cum road bridge with the following data and draw half plan at foundation and longitudinal section
<table>
<tr><th>Hydraulic particulars</th><th>U/S canal</th><th>D/S canal</th></tr>
<tr><td>Full supply discharge</td><td>16 m^3/s</td><td>12 m^3/s</td></tr>
<tr><td>Bed width</td><td>14 m</td><td>14 m</td></tr>
<tr><td>Bed Level</td><td>+15.00</td><td>+15.00</td></tr>
<tr><td>Full Supply Depth</td><td>2 m</td><td>1.60 m</td></tr>
<tr><td>F.S.L</td><td>+17.00</td><td>+16.60</td></tr>
<tr><td>Top level of bank</td><td>+18.00</td><td>+17.60</td></tr>
</table>
Top width of banks are the same as those on the upstream side. The regulator carries a road way single lane designed for IRC loading class ‘A’ provide clear free board of one meter above F.S.L. for the road bridge.
The right bank is 5 m wide and left bank is 2 m wide on both U/S and D/S.Good foundation soil is available at + 14.00 m and ground level +17.00</td><td>[L4][CO1]</td><td>[60M]</td></tr>
<tr><td>5</td><td>Design a regulator cum road bridge with the following data and draw half plan at foundation and longitudinal section
<table>
<tr><th>Hydraulic particulars</th><th>U/S canal</th><th>D/S canal</th></tr>
<tr><td>Full supply discharge</td><td>21 m^3/s</td><td>16 m^3/s</td></tr>
<tr><td>Bed width</td><td>15 m</td><td>15 m</td></tr>
<tr><td>Bed Level</td><td>+20.00</td><td>+20.00</td></tr>
<tr><td>Full Supply Depth</td><td>2 m</td><td>1.75 m</td></tr>
<tr><td>F.S.L</td><td>+22.00</td><td>+21.75</td></tr>
<tr><td>Top level of bank</td><td>+23.00</td><td>+22.75</td></tr>
</table>
Top width of banks is the same as those on the upstream side. The regulator carries a road way single lane designed for IRC loading class</td><td>[L4][CO1]</td><td>[60M]</td></tr>
</table>

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	'A' provides clear free board of one meter above F.S.L. for the road bridge. The right bank is 5 m wide and left bank is 2 m wide on both U/S and D/S.Good foundation soil is available at + 19.00 m and ground level +22.00		

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