

Code No: 07A80109

R07

SET 1

**B.Tech IV Year II Semester Examinations, April/May-2012**  
**DESIGN AND DRAWING OF HYDRAULIC STRUCTURES**  
**(CIVIL ENGINEERING)**

Time: 3 hours

Max. Marks: 70

Answer any ONE question

All questions carry equal marks

Assume suitable data wherever required. Use of Garrets diagrams,  
 Khosla's Charts, Lacey's Charts are permitted.

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1. Design a surplus weir of a work of tank forming a chain of tanks. The combined catchment area of the group of tank is 30 square kilometers and the area of the catchment intercepted by the upper tank is 28 square kilometers.
- |  |           |
|--|-----------|
| Top level of the tank bund             | : +20.00m |
| Top width of bund                      | : 2.00 m  |
| Side slopes of the tank on either side | : 2H: 1V  |
| F.T.L                                  | : +20.00  |
| Level of submersion of lands           | : +20.75  |
| Ground level                           | : +19.00  |

Assume any other suitable data.

Draw the Plan, L.S and L.E of the weir.

(OR)

2. Design a regulator-cum-road bridge with the following data:
- Hydraulic particulars of canal upstream:*
- |                       |                         |
|-----------------------|-------------------------|
| F.S. discharge        | : 22m <sup>3</sup> /sec |
| Bed width             | : 15 m                  |
| Bed level             | : +32.00                |
| F.S. Depth            | : 2 m                   |
| F.S.L                 | : +34.00                |
| Top level of the bank | : +35.00                |

The right bank is 5 m wide and left bank is 2 m wide.

*Hydraulic particulars of canal downstream:*

F.S. discharge	: 15m <sup>3</sup> /sec
Bed width	: 15 m
Bed level	: +32.00
F.S. Depth	: 1.80m
F.S.L	: +33.75
Top level of the bank	: +34.75

Top width of banks are same as those on the u/s side. The regulator carries a road way single line designed for IRC loadings class 'A'. Provide clear free board of one meter above F.S.L for the road bridge.

Good foundation is available at +31.00

Assume ground level at site as +34.00.

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SET 2

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**(CIVIL ENGINEERING)**

Time: 3 hours

Max. Marks: 70

Answer any ONE question

All questions carry equal marks

Assume suitable data wherever required. Use of Garrets diagrams,  
 Khosla's Charts, Lacey's Charts are permitted.

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1. Design a surplus weir of a work of tank forming a chain of tanks. The combined catchment area of the group of tank is 40 square kilometers and the area of the catchment intercepted by the upper tank is 30 square kilometers.

Top level of the tank bund	: +22.00m
Top width of bund	: 2.00 m
Side slopes of the tank on either side	: 2H: 1V
F.T.L	: +20.00
Level of submersion of lands	: +20.75
Ground level	: +19.00

Assume any other suitable data.

Draw the Plan, L.S and L.E of the weir.

(OR)

2. Design a sluice (tank sluice with tower head) taking off from a tank with a following data: of

Discharge	: 0.35m <sup>3</sup> /sec
Top width of the bund	: 2.0 m
Side slopes	: 2: 1
Top level of the bank	: +51.00
Ground level at the site	: +45.50
Sill of the sluice at off-take is	: +45.00
Maximum water level in the tank	: +49.00
Full tank level is	: +48.00
Average low water level is	: +46.00

Good hard soil for foundation is available at +44.50.

*Details of canal below the sluice*

Bed level	: +45.00
F.S.L	: +45.50
Bed width	: 1.50 m
Side slopes	: 1½ to 1 with top of bank at +46.50

Draw the longitudinal section. Assume any other suitable data.

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SET 3

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**(CIVIL ENGINEERING)**

Time: 3 hours

Max. Marks: 70

Answer any ONE question

All questions carry equal marks

Assume suitable data wherever required. Use of Garrets diagrams,  
 Khosla's Charts, Lacey's Charts are permitted.

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1. Design a sluice (tank sluice with tower head) taking off from a tank with a following data:

Discharge	: 0.20m <sup>3</sup> /sec
Top width of the bund	: 2.0 m
Side slopes	: 2: 1
Top level of the bank	: +48.00
Ground level at the site	: +42.50
Sill of the sluice at off-take is	: +42.00
Maximum water level in the tank	: +46.00
Full tank level is	: +45.00
Average low water level is	: +43.00

Good hard soil for foundation is available at +41.50.

*Details of canal below the sluice*

Bed level	: +42.00
F.S.L	: +42.50
Bed width	: 1.30 m
Side slopes	: 1½ to 1 with top of bank at +43.50

Draw the longitudinal section. Assume any other suitable data.

(OR)

2. Design a siphon aqueduct (type-III) for forming the canal through an RCC trough with the following data:

Discharge of the canal	: 32 cumecs
Bed width of the canal	: 20 m
Depth of water in the canal	: 1.5 m
Bed level of the canal	: +160.50m
High flood discharge of the drainage	: 400 cumecs
High flood level of the drainage	: +161.00 m
Bed level of the drainage	: +158.50 m
General ground level	: +160.50 m
Canal free board	: 1.0 m
Canal side slopes both inside and outside are	2: 1 in embankment

Top width of the bank on left side is 5m carries a road way while the top width on the right bank is 3m.

The foundations of abutments and respective wing-wall and returns both on the u/s and d/s side are taken to the respective scour depth levels assuming silt factor as 1.0. Hard soil fit for foundation is available below at +156.50m.

Limiting velocity in the drainage not to exceed 2.5 m/sec.

The velocity in the canal trough is not to exceed twice the normal velocity in the canal. Find out the loss of head in the canal due to the crossing by total energy line method. Similarly find out the H.F.L of the drain u/s of the structure, keeping the normal H.F.L of the drain at the d/s side returns of the drainage barrel.

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SET 4

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**(CIVIL ENGINEERING)**

Time: 3 hours

Max. Marks: 70

Answer any ONE question

All questions carry equal marks

Assume suitable data wherever required. Use of Garrets diagrams,  
 Khosla's Charts, Lacey's Charts are permitted.

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1. Design a canal drop of 2m of trapezoidal notch type with the following data:

<u>Canal</u>	<u>U/s</u>	<u>D/s</u>
Full supply discharge	5 m <sup>3</sup> /s	5 m <sup>3</sup> /s
Bed level	+112.0 m	110.00m
Bed width	7.0 m	7.0 m
Full supply depth	1.50 m	1.50 m
Full supply level	+113.50 m	111.50 m
Top of the bank	2.0 m at 114.50	2.0 m at 112.50
Half supply depth is	1.0 m.	--
Ground level at the site of the work is +112.50 m.		
Good soil is available for foundation is +110.50 m.		

Assume any other suitable data. Draw the L.S of the canal drop.

(OR)

2. Design a concrete sloping glacis weir for the following conditions:

Maximum discharge intensity on weir crest	: 10 cumecs/m length
H.F.L before construction of weir	: 252.00 m
Reduced level of river bed	: 246.50 m
Pond level	: 251.00m
Height of crest shutters	: 1 m
Bed retrogression	: 0.5 m
Lacey`s silt factor	: 0.9
Permissible exit gradient	: 1/7
Permissible afflux	: 1 m

Anticipated downstream water level in the river when the weir is discharging with pond level upstream = 249.5m.

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