Bengal Engineering and Science University, Shibpur

M.E. (Civil) 2nd Semester Examination, April, 2013

Sub: Hydraulic Structures-II (CE-1015)

Time: Three hours | Full Marks: 70

Figures in the margin indicate full marks

Candidates are allowed to consult any materials like books and class notes.

Answer Q. No. 5 and any three from the rest

1. Design a vertical drop weir on the basis of Bligh's theory for the following data and also draw a neat sketch of the weir. (20)

i) Maximum flood discharge = 1800 cumec
ii) H.F.L. before construction of weir = 200m
iii) River bed level = 194 m
iv) F.S.L. of canal = 198m
v) Allowable afflux = 1.2m
vi) Coefficient of creep = 15

Test the floor of the weir by Bligh's theory.

2. The following data of a glacis weir was obtained : (20)

i) Maximum discharge intensity on weir crest = 20cumec/m
ii) H.F.L. before construction of weir = 225m
iii) River bed level = 212.5m
iv) Pond level = 224m
v) Height of crest shutters = 2m
vi) Downstream water level in the river when the weir is discharging with pond level upstream = 220m
vii) Bed retrogression = 0.5m
viii) Lacey's silt factor = 0.9
ix) Permissible exit gradient = 1/7
x) Permissible afflux = 1.5m

Calculate the length of impervious floor and elevation of subsoil hydraulic gradient line for different conditions. Also plot the hydraulic gradient line.

3. Design the waterway and impervious floor of a distributary head regulator for a distributary taking off from a branch canal: (20)

i) Discharge of branch canal = 150 cumec
ii) Discharge of distributary = 35 cumec
iii) F.S.L. of branch canal : u/s = 120.5 m
iv) F.S.L. of branch canal d/s = 120 m
v) Bed width of branch canal : u/s = 50m
vi) Bed width of branch canal : d/s = 45
vii) Depth of water in the branch canal : u/s and d/s both = 3.5m
viii) F.S.L. of distributary = 119m
ix) Bed width of distributary = 18m
x) Depth of water in the distributary = 2.5m
xi) Permissible exit gradient = 1/6

4. A syphon aqueduct is to be designed across a stream for the following data: (20)

Canal – Discharge = 56 cumec, Bed width = 32m, Water depth = 2m, R.L. of bed = 267m
Drainage – High flood discharge = 425 cumec, High flood level = 268.2m, General bed level of low water cross-section = 265.5m, General ground level = 267.2m

Find the size of barrels required for drainage and also design the expansion transition for the canal. Also find the uplift on the barrel roof. Make suitable assumptions where required.

5. Write short notes on i) Launching apron ii) Undersluices iii) Fish ladder (10)