Form A: Paper-setting Blank

Ref No. Ex/CE/T/422/2017 (Old)

B.E.CIVIL ENGG 4th YEAR 2nd SEM. 2017 (OLD)

(~~1st~~ /2nd-Semester/~~Repeat/Supplementary /Spl. Supplementary /Old/Annual/Bi-Annual~~)

SUBJECT: **HYDRAULIC STRUCTURES**

(Name in full)

Time: ~~Two hours~~/ Three hours/~~Four hours/Six hours~~ **Full Marks ~~30~~/100**

(~~45~~/50 marks for each part)

Use a separate Answer-Script for each part

1. Answer ANY TWO questions.
2. Assume reasonable values of data if not supplied.
3. No code etc. will be needed to answer the questions of this part

No. of Question		Part –I	Marks
Q.1	a)	Explain how the entrance width of a harbour depends on the height of the wave.	5
	b)	Illustrate classification of harbour according to its utilities	5
	c)	A masonry dam, 10m high, is trapezoidal in section with a top width of 1m 8.25m. The face exposed to water has a batter of 1H: 10V. Test the stability of the dam for water thrust, self weight and uplift. Also find the hydrodynamic force on upstream face of the dam by any suitable method.	8+7=15
Q.2	a)	Illustrate piping failure below hydraulic structure founded on pervious foundation with the help of a neat sketch.	3
	b)	A hydraulic structure has a horizontal floor distance between u/s and d/s pile lines of 25m. The lengths o fu/s and d/s pile lines are 6 m and 8m respectively and the working head is 4m. Draw the hydraulic grade line and determine the floor thickness at 5m, 10m and 15m from u/s pile line using Khosla's method, Also find the safety of the hydraulic structure against piping failure assuming any appropriate soil condition.	15
	c)	Illustrate the purpose of fender and also mention materials by which it can be made and the use of such materials In this case.	7
Q.3	a)	Illustrate how stability of breakwater is determined and also the factors affecting its height.	4+3=7
	b)	Illustrate Composite type breakwater with the help of a neat sketch.	5
	c)	Find out principal stresses at the toe and heel of the dam mentioned in Q.1 (c).Given that unit weight of masonry is 22.40 kN/m^3.Also explain the need of finding principal stresses at toe and heel.	13

BACHELOR OF CIVIL ENGINEERING EXAMINATION 2017

(Fourth Year; Second Semester)

HYDRAULIC STRUCTURES

Time: Three Hours — Full Marks 100

(50 marks for each part)

Use a separate Answer-Script for each part

No. of questions		Part II (50 Marks)	Marks
		*Answer **ANY TWO** questions from this part. Assume suitable values for the parameters if not supplied.*	
1	(a)	Note down the head loss with a sketch, at different stages from the inlet well to the downstream full supply level, in case 'syphon well drop' type canal fall structure.	5
	(b)	Design and provide a neat sketch of a siphon type well drop canal fall structure for the following design data: Fall = 4.0m General ground level = +160.36m RL Full supply depth = 75cm Bed level at u/s = +159.83m RL Discharge = 1.2 Cumecs Bed width = 2.4m Assume Darcy's Coefficient of friction 0.012 and Length of the pipe 12m.	15+5=20
2	(a)	What is spillway? What is called 'Emergency Spillway'?	1+1=2
	(b)	What are the factors, which affect the design of spillway?	4
	(c)	What are the factors, which affect the coefficient of discharge over spillway? Explain briefly. What is design discharge through Ogee spillway? Explain briefly.	4
	(d)	An overflow ogee spillway of height 12m is discharging water with a head of 3m over the crest. A	2
	(e)	reverse curvature of radius 5m, subtending an angle of 60° at the centre, is provided at the spillway bottom. Assuming the discharge coefficient for the spillway as 2.2, determine the magnitude and direction of the dynamic force on the reversed curved portion of the spillway.	13
3	(a)	Define 'Freeboard' for Hydraulic Structures. Also define 'Fetch' and 'Effective Fetch'. How do you estimate 'Effective Fetch'? Explain Briefly.	2+3+5=10
	(b)	Compute 'Freeboard and the top elevation of the dam for the following details: Full reservoir level = 335.00m; Maximum water level = 337.20m Effective fetch: For normal freeboard = 3.66km & minimum freeboard = 4.00km Wind velocity over land for normal freeboard = 160km/hr Average depth of reservoir: For normal freeboard = 29.0m & minimum freeboard = 31.2m. Embankment slope = 2.25(H):1(V) along with the following coefficients: • The upstream face surface roughness = 0.75 • The ratio of wind velocity over water surface to the wind velocity over land surface for effective fetch 2 and 4 as 1.16 and 1.24 respectively • Variation of the Relative Run-up (R/H_0) against Embankment Slope is as follows:	15

Embankment slope	0.1	0.2	0.3	0.4	0.5	0.6
Relative Run-up, R/H_0	0.368	0.752	1.200	1.600	1.968	2.272