

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION 2025

(Fourth Year, Second Semester)

WATER RESOURCES ENGINEERING IIIE

Time: Three Hours

Full Marks: 100

SL No		Question No. 1 is mandatory & attempt any one question from each of the three groups; Assume suitable values for the parameters if not supplied	Marks																										
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1	(a) (b)	What are the basic data required for sediment budgeting of a coastal stretch? Explain briefly. In a coastal stretch, the average elevation of the sea beach was found to be 0.635m RL. Design an three layers of armored groin, in terms of length, RL of the top of the proposed groin, and weight of top layer armor unit to arrest 80% sediment. Please note that HTL=3.92m RL in that proposed coastal stretch and wave height=1.34m. Provide a detail neat sketch of the designed section. Assume a minimum freeboard, with the stability coefficient (K_D) = 2.2 and layer coefficient (K_Δ) = 1.15. Given that Unit weight of armor material is 2700 kg/m3.	CO4 10 15																										
GROUP A (Attempt any one question from this group)																													
2	(a) (b) (c) (d)	What are the differences between wind-generated waves and tsunami waves? Discuss the probable effects of tsunami on coastal dynamics, and sediment dynamics. Discuss the limiting condition for triggering tsunami due to submarine earthquake. The tsunami waves, having average wave height 25m and wave period 35minutes have arrived at the coast. The vegetated coastal land having average ground slope 1:80, could resist the run-up by 20%. Calculate the buffer distance from the coast to be evacuated.	CO1 5 7 7 6																										
3	(a) (b) (c)	Produce a neat sketch of general profile of 'Coastal Zone' and indicate all labels. What are the natural shore protections? Indicate the equivalent artificial shore protection. Discuss the functions of bulk head and groin at coast.	CO1 10 10 5																										
GROUP B (Attempt any one question from this group)																													
4	(a) (b) (c) (d)	What are the assumptions made in tide theory? What are the forces responsible for tide generation? Define 'Equilibrium tide' and 'Daily inequality in tide'. On the line joining Earth and Moon, A & B are diametrically opposite two points on the Earth's surface, on equator. Prove that the tide producing force at A & B would be same in magnitude but opposite in direction. Neglect the Sun's Gravitational attraction.	CO2 3 3 3x2=6 13																										
5	(a) (b) (c) (d)	What is littoral drift in ocean? What are the parameters on which littoral drift depends? Define: Point source and sink, Line source and sink, Littoral cell, Balanced littoral cell. Draw a schematic diagram of the coastal cell for its sediment budgeting. What are the steps involved for coastal sediment budgeting? Explain briefly.	CO2 3+5=8 4x1=4 6 7																										
GROUP C (Attempt any one question from this group)																													
6	(a) (b)	Define 'Freeboard' for coastal structures. Also define 'Fetch' and 'Effective Fetch'. How do you estimate 'Effective Fetch'? Explain Briefly. Compute 'Freeboard and the top elevation of the armored coastal structure having life of 20 years for the following details: Mean high tide level = 2.750m RL; Maximum high tide level = 3.270m RL Effective fetch: For normal freeboard = 10.0km & minimum freeboard = 13.0km Wind velocity over water for normal freeboard = 150km/hr & minimum freeboard 50km/hr U/s slope of the structure (V:H) = 1:6 (upper part) and 1:10 (lower part) 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 ≥ 10 km is 1.31 • Variation of the Relative Run-up (R/H_0) against Embankment Slope is as follows: <table border="1"><tr><td>Embankment slope</td><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td><td>0.5</td><td>0.6</td></tr><tr><td>Relative Run-up, R/H_0</td><td>0.368</td><td>0.752</td><td>1.200</td><td>1.600</td><td>1.968</td><td>2.272</td></tr></table> Assume sea level rise 2.0mm per year and average settlement of said structure 30mm per 10 years	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	CO3 2+4+4=10 15												
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Relative Run-up, R/H_0	0.368	0.752	1.200	1.600	1.968	2.272																							
7	(a) (b) (c)	What is called wave motion? How many types of wave motions can be seen in the ocean? Explain briefly. Define: (i) Group wave celerity; (ii) Wave steepness; (iii) Significant wave height In a wave measurements programme, the wave height and period was measured at a water depth of 9.0m as follows: <table border="1"><tr><td>Wave Height (m)</td><td>1.70</td><td>1.69</td><td>1.68</td><td>1.62</td><td>1.57</td><td>1.60</td><td>1.63</td><td>1.69</td><td>1.59</td><td>1.48</td><td>1.60</td><td>1.62</td></tr><tr><td>Wave period (sec)</td><td>12</td><td>11</td><td>11</td><td>12</td><td>10</td><td>10</td><td>10</td><td>11</td><td>10</td><td>9</td><td>10</td><td>11</td></tr></table> Estimate (i) Significant wave height; (ii) Wave celerity and group wave celerity; (iii) Wave power and energy; (iv) Wave length; (v) Breaker height and length, if breaker depth is 2.0m.	Wave Height (m)	1.70	1.69	1.68	1.62	1.57	1.60	1.63	1.69	1.59	1.48	1.60	1.62	Wave period (sec)	12	11	11	12	10	10	10	11	10	9	10	11	CO3 3+4=7 3x1=3 15
Wave Height (m)	1.70	1.69	1.68	1.62	1.57	1.60	1.63	1.69	1.59	1.48	1.60	1.62																	
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