**QUESTION BANK**

**COURSE: SEDIMENT TRANSPORT (HE704) YEAR/SEM: 4th /VII**

**UNIT-I-NEARSHORE ENVIRONMENT**

**PART-A**

**EACH QUESTION CARRIES 2 MARKS**

1. Write a short note on wind waves
2. Differentiate sea and swell
3. Differentiate wave celerity and group celerity?
4. Define celerity ratio (n)?
5. Define wave energy.
6. Define wave energy flux.
7. Define coastal Geomorphology.
8. Define Sea level Rise.
9. What is fluid dynamics?
10. Define wave height.
11. What is wave period?
12. Draw with neat sketch about anatomy of ocean wave.
13. What is wave dispersion equation?
14. What is wave breaking criterion?

**PART-B**

**EACH QUESTION CARRIES 4 MARKS**

1. Determine the maximum horizontal water particle velocity for a wave of height 2m, period of 10s in a depth of 200m.
2. Calculate the celerity and deep water wave length of 10s period wave for a linear progressive wave.
3. Derive wave pressure coefficient from linear wave theory.
4. Calculate the dynamic pressure at a point 20m below the still water level for a wave of period T = 10 s, height H = 2 m in a depth of 30 m.
5. Derive horizontal water particle velocity from linear velocity potential.
6. A wave has a height of 1.5 m in water 5 m deep and a wave period of 6 s. Find the horizontal component of velocity, at a point 2 m below the still water level
7. Calculate the celerity ratio for a wave of period T= 8s, a wave height of H = 1.5 m in a depth of water , d= 6m.
8. Calculate the energy flux for a wave of period, T= 10s and a wave height, H=2m in a depth of water, d=10m (8 marks)
9. Define wave energy and wave energy flux.
10. Derive celerity ratio for deep water condition.

**PART-C**

**EACH QUESTION CARIES 14 MARKS**

1. Define Coastal geomorphology and List out the different types of coastal Morphology.
2. A wave train is observed approaching a coast that has straight parallel nearshore bottom contours that are oriented at an angle of 9 degrees with the shore line and the wave period is measured to be 7.3 s. What is the incident wave direction in deep water? If measured wave height at the 5 m depth is 2.2 m, what is the deep water wave height?
3. Calculate median particle size and degree of sorting for the following data (use graph sheet)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Particle size (mm) | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |
| Weight retained in (gms) | 10 | 20 | 30 | 30 | 10 |

1. (a)Explain about different types of coastal features with neat sketch ?

(b) Write a short note on physical properties of sediment?

1. (a)Explain breaker types with a neat sketch

(b)How do you classify breakers using surf similarity parameters

(c)A wave of period 6s has a height of 1.67 m in a water depth of 6. What kind of breaker the wave will experience when it propagates on to a beach slope of 30 degrees without refracting.

1. (a)Define celerity ratio (n) ?

(b)Define the following wave shoaling, wave refraction, wave diffraction and wave breaking ?.

(c)Calculate the celerity ratio for a wave of period T= 8s, a wave height of H = 1.5 m in a depth of water , d= 6m

1. A wave of period 6s has a height of 1.67 m in a water depth of 6. What kind of breaker the wave will experience when it propagates on to a beach slope of 30 degrees without refracting.
2. (a)Explain in detail about hydro dynamically smooth and rough boundaries?

 (b)Explain breaker types with a neat sketch

 (c)How do you classify breakers using surf similarity parameter.

1. A wave train is observed approaching a coast that has straight parallel nearshore bottom contours that are oriented at an angle of 9 degrees with the shore line and the wave period is measured to be 7.3 s. What is the incident wave direction in deep water? If measured wave height at the 5 m depth is 2.2 m, what is the deep water wave height?

**UNIT-II-PARTICLE DYNAMICS AND SEDIMENT TRANSPORT**

**PART-A**

**EACH QUESTION CARRIES 2 MARKS**

1. Write three processes in the sediment transport phenomena?
2. What are the applications of studying the sediment transport?
3. What is bed shear stress?
4. What is Nikurades bed roughness length?
5. Explain the cross shore sediment transport?
6. Define Stokes law
7. Classify sediments. Define Shingle
8. How to sand bar forms.
9. Differentiate erosion and accretion
10. Write a short note on scour action.

**PART-B**

**EACH QUESTION CARRIES 4 MARKS**

1. Explain breaker types with a neat sketch
2. How do you classify breakers using surf similarity parameters
3. Write a short note on wave breaking with its definition sketch.
4. What are the limitations of Morison’s equations
5. Derive an expression for conservation of mass.
6. Derive an expression for Euler Equation of motion
7. Derive an expression for Navier- Stokes Equation.
8. Discuss about turbulent flow analysis and Prandtl- Mixing length theory.
9. What is mean velocity and Sketch the velocity profile?
10. What is beach profile and Explain different types of beach profiles?
11. A wave of period 6s has a height of 1.67 m in a water depth of 6. What kind of breaker the wave will experience when it propagates on to a beach slope of 30 degrees without refracting.( 4 marks)
12. Write the general procedure for sediment studies.
13. Explain in detail about the behaviour of marine sands.
14. Describe about the modes of sediment transport with neat sketch
15. What is beach profile and Explain different types of beach profiles

**PART-C**

**EACH QUESTION CARIES 10 MARKS**

1. For a wave in water depth, d=70m with wave period T=10s, deep water wave height Ho = 4m, evaluate the variation in the wave height when the wave approaches shallow water. Also determine the depth of water in which the wave would break theoretically
2. A vertical cylinder pile having a diameter of 0.3 m is installed in water that is 8 m deep. For an incident wave having a height of 2 m and a period of 7 s. determine the horizontal force on the pile when the pile is situated at the halfway point between the crest and still water line of the passing wave. Cd = 0.72, Cm = 1.8
3. (a)Write a short note on sediment budget concept and analysis

(b)Explain briefly about sediment transport: bed load and suspended load

1. Write a short note on physical properties of sediment
2. Discuss in detail about wave induced nearshore currents.
3. A wave with T = 10 s propagates from deep water with an angle of 60 degree to the axis perpendicular to the coast. Determine the wave angle and celerity as the wave propagates in depths of 15 m, 10 m, and 5 m.
4. For an average deep water wave height of 1.5 m, Tav=10 s and θo=50°, determine the length of wave energy device if it is to located in water depth of 6 m and power required is 200 KW. Assume that the device is aligned paralled to the wave crest.
5. 500 m long vertical wall is constructed along the coast. If the wall is fully exposed to waves, determine safe deck elevation and maximum horizontal displacement at the node. Deep water wave characteristics are Ho = 3 m, T = 8 s and θo=40°. Assume that water depth at the wall is 7 m.
6. Explain in detail about the Beach process.
7. Explain in detail about ocean currents.
8. Calculate mean velocity for surface u1 = 2.5 m/s @ 1 m below water surface, u5 = 2.0 m/s @ 5 m below water surface and u10 = 0.5 m/s @ 10 m below water surface?
9. Given data: Mean velocity U = 2.0 m/s, Density of water = 1027 kg/m3, Density of sand = 2650 kg /m3, Particle size = 0. 4 mm

Calculate the following: i) Bedshear stress (Ƭ),

 ii) Dimensionless particle size (D\*), iii) Critical shield parameter (ѲCR) and iv) Drag coefficient (CD)

1. (a)Different types of current and wave generated bed features? (5marks)

(b)Write short notes on error and sensitivities in sediment transport calculation? (5marks)

1. (a)Draw with neat sketch current and wave generated bed forms. (5marks)

(b)Explain about different types of coastal features with neat sketch? (5marks)

1. Calculate depth average current speed for 10 m depth of water column, if u1 = 2.5 m/s @ 1 m below water surface, u5 = 2.0 m/s @ 5 m below water surface, and u8 = 0.5 m/s @ 8 m below water surface? And also obtain the following parameters, if the grain-diameter of sea bed = 1 mm, density of seawater = 1027 kg/m3,

(i) Friction velocity (ii) bed shear stress and (iii) Nikuradse roughness (ks).

**UNIT-III- BED LOAD, SUSPENDED LOAD AND TOTAL LOAD SEDIMENT TRANSPORT**

1. Define rip currents
2. Define longshore currents
3. Define littoral drift
4. What are the different types of sand tracers?
5. What is tombolo
6. Define Threshold motion?
7. Define settling velocity?
8. What is meant by saltation height?
9. Discuss about wave-current boundary layer?
10. What is Rouse number

**PART-B**

**EACH QUESTION CARRIES 4MARKS**

1. Define bedload, suspended load, wash load and total load sediment transport?
2. What are parameters causes for bedload transport
3. What are the applications of studying the sediment transport?
4. Explain the cross shore sediment transport?
5. Define the rate of sediment transport with unit.
6. Define degree of sorting and median particle size?
7. What is logarithmic velocity profile ?
8. Define the settling velocity.
9. What is tractive force?
10. Write short notes on Properties of Seawater

**PART-C**

**EACH QUESTION CARRIES 12 MARKS**

1. A train of waves has a height of 1.3 m and an approach angle of 15 degree at the breaker line. The average beach slope in the surf zone is 1: 30 (m=0.033). Estimate the alongshore flow rate in the surf zone
2. (a) How do you measure sediment transport?

(b) Explain different types of sand traps for measuring bed load and suspended load

1. A beach consists of quartz sand particles having an average median settling diameter of 0.27 mm. Assume stokes law is valid to define particle settling velocity. Plot, on a graph of wave height H0 versus period T, the line separating eroding and accreting beach profiles. Use a range of Ho & T values common to the ocean environment.
2. Waves approach a sand beach and break in water 1.1m deep, with the wave crests forming an angle of 12 degrees, with the shoreline. Estimate the volume of sand that is transported alongshore in one hour.
3. A wave train has a deep water height of 2.5m and a period of 7s. It propagates toward the shore across essentially shore parallel bottom contours. In deep water, the wave crests lie at an angle of 36 degrees to the bottom contours and shoreline. What is the potential longshore sediment transport volume in a period of one hour?
4. Describe and derive the expression for the particle suspension mechanism in suspended sediment transport
5. Calculate the total load sediment transport rate in a tidal current, using the Ackers and White method, given the following data: Depth Mean velocity U = 2.0 m/s, Density of water = 1027 kg/m3, Density of sand = 2650 kg /m3, Particle size D= 0. 4 mm, water depth h = 10 m, kinematic viscosity = 1.36x10-6 m2/s.
6. Calculate the total load sediment transport rate in a tidal current, using the Van Rijn method, Given the following data: Depth Mean velocity U = 2.0 m/s, Density of water = 1027 kg/m3, Density of sand = 2650 kg /m3, Particle size D= 0. 4 mm, water depth h = 10 m, kinematic viscosity = 1.36x10-6 m2/s.
7. What are the wave mechanisms causes for total sediment transport? and write the bailard equation.
8. (a) Derive expression for the suspended sediment concentration under currents?

 (b) What are parameters causes for bedload transport?

**UNIT-VI-ALONSHORE AND CROSSHORE SEDIMENT TRANSPORT**

**PART-A**

**EACH QUESTION CARRIES 2 MARKS**

1. Define rip currents?
2. Define longshore currents?
3. Define littoral drift?
4. Define surfzone width?
5. What are the different types of sand tracers. ?
6. Distinguish Bulkheads from Revetments
7. List the coastal protective structures
8. Draw the cross section of rubble mound breakwater
9. Distinguish training walls from sea walls
10. What are concrete armor units

**PART-B**

**EACH QUESTION CARRIES 4 MARKS**

1. Explain in detail about rubble mound breakwater with a neat sketch
2. What are the different types of breakwaters
3. Write a short note on groins
4. Discuss in detail where it is appropriate to use groins for shore stabilization
5. Discuss indetail about the non-structural coastal protective method of Beach Nourishment
6. Discuss indetail about the non-structural coastal protective method of Sand Bypassing
7. Discuss indetail about the non-structural coastal protective method of Vegetation planting.
8. Discuss in detail about longshore transport rate estimation
9. Explain in detail and draw flow chart for surfzone model
10. How do you measure sediment transport?

**PART-C**

**EACH QUESTION CARRIES 14 MARKS**

1. What is different between empirical methods and process based method ?

What are the significance among the three empirical methods viz., CERC, Khamphuis and Van Rijn?

1. (a) Write a short note on sediment budget concept and analysis

 (b) Explain briefly about net sediment transport and gross sediment transport

1. A train of waves has a height of 1.5 m and an approach angle of 15 degree at the breaker line. The average beach slope in the surf zone is 1: 30 (m=0.033) and peak wave period Tp = 8 sec. Estimate the alongshore sediment transport rate in the surf zone by CERC method and Kamphuis method.
2. Using the annualized wave climate data given in the following table, estimate net alongshore transport rate for a natural beach site with a beach slope of 1 in 100 and a D50 grain size of 0.4 mm.

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Hsb (m)
 | 1. Tp (s)
 | 1. Ѳb (deg.)
 | 1. Frequency (%)
 |
| 1. 0.8
 | 1. 4.5
 | 1. 25
 | 1. 5
 |
| 1. 1.2
 | 1. 5.5
 | 1. 15
 | 1. 10
 |
| 1. 1.5
 | 1. 6
 | 1. 5
 | 1. 15
 |
| 1. 1.3
 | 1. 6
 | 1. -5
 | 1. 12
 |
| 1. 1.1
 | 1. 5.5
 | 1. -15
 | 1. 8
 |
| 1. 0.5
 | 1. 4
 | 1. -25
 | 1. 5
 |

1. (a)Discuss in detail about longshore transport rate estimation?

 (b) Explain in detail and draw flow chart for surfzone model?

1. (a) Write a short note on sediment budget concept and analysis

 (b) Explain briefly about net sediment transport and gross sediment transport

 (c) What is the significance among the three empirical methods viz., CERC, Khamphuis and Van Rijn?

1. Calculate median particle size and degree of sorting for the following data (use graph sheet)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Particle size (mm) | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |
| Weight retained in (gms) | 10 | 20 | 30 | 30 | 10 |

1. Calculate median particle size and degree of sorting for the following data (use graph sheet)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Particle size (mm) | 0.15 | 0.22 | 0.35 | 0.45 | 0.7 |
| Weight retained in (gms) | 25 | 40 | 50 | 25 | 60 |

1. Calculate mean velocity for surface u1 = 2.5 m/s @ 1 m below water surface, u5 = 2.0 m/s @ 5 m below water surface and u10 = 0.5 m/s @ 10 m below water surface?
2. Explain in detail about the motion initiation of seabed sediments with neat sketch

**UNIT-V-** **COASTAL MORPHOLOGY, ANALYSIS, MODELING AND PREDICTION**

**PART-A**

**EACH QUESTION CARRIES 2 MARKS**

1. List the coastal protective structures?
2. What is mean by morphodynamics and scour?
3. How does sand bar forms.
4. What is tombolo ?
5. Explain about sand Trap?
6. What are the different types of sand tracers?
7. What is Rouse number?
8. Define degree of sorting and median particle size?
9. List the environmental parameters for dynamics of marine sand?
10. Define littoral drift?

**PART-B**

**EACH QUESTION CARRIES 4 MARKS**

1. Explain shore response to a series of shore parallel and perpendicular structures?
2. Write continuity equation for shoreline change modelling with neat sketch?
3. Explain with neat sketch about beach profile taxonomy?
4. Write a short note on groins
5. Derive the expression about the numerical scheme for shoreline change modelling
6. Discuss about analytical solution and numerical solution for prediction of future coast?
7. Explain different types shoreline management strategies?
8. How do you protect the Pudhuchery coast from the coastal erosion?
9. Derive the expression about the numerical scheme for shoreline change modelling?
10. Discuss about analytical solution and numerical solution for prediction of future coast?

**PART-C**

**EACH QUESTION CARRIES 14 MARKS**

1. Describe and derive the expression for the particle suspension mechanism in suspended sediment transport?
2. Explain in detail about the motion initiation of seabed sediments with neat sketch.
3. Discuss in detail about the non-structural coastal protective methods

(i)Beach Nourishment (ii) Sand Bypassing (iii) Vegetation planting

1. (i) A deep water wave propagates with an initial wave height of Ho= 5 m, T =15 s, θo=45°. Determine wave characteristics (with shoaling and refraction) and wave power as the wave reaches water depth of 10 m, (ii) If water level increase is of the order of 3 m during high tide, determine wave characteristics.
2. Derive an expression for Airy’s linear wave theory.
3. A wave of wave height is 3 m travels from 10 m depth to near shore and wave period 10 s. Determine the following.

(i)State the wave condition at 10 m depth.

(ii)Find the wave height and wave energy at 6 m and at 3 m depth if Ks = 0.99, Kr=0.85 at 6 m depth and Ks =0.90 and Kr=0.80 at 3 m depth.

(iii)Find the wave celerity at 6 m and 3 m depth.

(iv)Find the surfzone width the maximum breaking wave height is 4.5 m. If Beach slop is 1:250.

1. Discuss briefly about sea level Rise.
2. Discuss briefly about characteristics of currents with neat sketch.
3. (a)What is tractive force?

(b)What is the velocity at the seabed?

(c)What is skin friction?

(d)Define the rate of sediment transport with unit.

(e)Define degree of sorting and median particle size?

1. (a)Derive the expression about the numerical scheme for shoreline change modelling

 (b) Discuss about analytical solution and numerical solution for prediction of future coast?