

Total No. of Questions :12]

SEAT No. :

P3668

[Total No. of Pages : 3

[4959]-1028

B.E. (Civil)

MECHANICS OF WAVES

(2012 Course) (Elective-IV) (Open Elective) (401010 DV) (Semester-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Your answer will be valued as a whole.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) a) Discuss classification of waves in detail. **[4]**

b) Write a short note on WAVEWATCH III: a numerical model. **[3]**

OR

Q2) a) Define fully developed sea, partially developed sea, swell. **[4]**

b) Write a short note on SWAN: a numerical model. **[3]**

Q3) a) Derive equation for celerity starting from linear dispersion relationship. **[3]**

b) Enlist assumptions made in wave theories. **[4]**

OR

Q4) a) For a wave height of 2.5m and 10 sec period obtain maximum horizontal and vertical displacement of water particle with mean position at (i) SWL (ii) sea bed. Depth of sea bed = 12m. **[4]**

b) Derive expression for group wave velocity. **[3]**

P.T.O.

- Q5) a)** Write short notes on wave breaking, wave set up. [2]
- b) A wave of significant height 3.5m and period 10 sec in deep water travels towards shore parallel to bed contours. If its crest makes an angle of 30 with bed contour of 12m before refraction calculate wave height after crossing the contour. [4]

OR

- Q6) a)** Write a short note on shoaling. [3]
- b) Draw sketches for wave refraction in different cases. [3]

- Q7) a)** Annual data of significant wave heights collected for a site along the East coast of India is given below: [6]

| | | | | | | |
|---------------------|------|-----|-----|-----|----|---|
| H_s (in m) | 0 | 1 | 2 | 3 | 4 | 5 |
| No. of observations | 1198 | 999 | 322 | 112 | 15 | 2 |

Obtain the design H_s value corresponding to 200 years return using the Gumbel distribution.

- b) Write short note on Pierson-Muskowitz Spectrum. [4]
- c) What is long term wave height statistics? Name various distribution used to achieve the same while explaining Weibull distribution in detail. [6]

OR

- Q8) a)** The annual maximum wave heights observed at Pondecherry in m are as follows; 4, 5.23, 3.77, 5.88, 4.53, 4.59, 3.94, 3.12, 3.42, 6.96, 6.24, 4.43, 2.05, 5.23, 2.34, 1.25, 1.67, 3.45, 3.67, 2.35. Find wave height of 50 year return period. For $N = 20$, $\bar{y}_n = 0.5236$, $S_n = 1.0628$. [6]
- b) Write short note on JONSWAP method. [4]
- c) Distinguish between short term analysis-long term analysis, probability density function-probability distribution function. [6]

- Q9) a)** Draw neat figure for describing typical beach profile and explain the terms: the beach and near shore zone. [4]

- b) What are the man made causes of shore line erosion, elaborate in detail. [6]
- c) What are the different shore protection methods, explain in detail. [6]

OR

- Q10)**a) Define the sea, surf zone, currents, tides, storm surge, tsunamis. [5]
- b) What are the natural causes of shore line erosion, elaborate in detail. [5]
- c) Write note on: [6]
- i) Normal shore response.
- ii) Beach response to storms.

- Q11)**a) What are the profiles? What is profile accuracy? Mention four types of errors related to profile accuracy? [6]
- b) Explain in detail two zone of littoral transport. [6]
- c) Determine the total sediment transport due to waves and currents for the following data. Consider a deep water wave of height 2m period = 10 secs and with 70° angle. Adopt Bijker's formula for estimating bed load transport. [6]

Data: $\rho_w = 1025\text{kg/m}^3$, $\nu = 10^{-6} \text{ m}^2 / \text{s}$, $U = 0.7\text{m /s}$, $\rho_s = 2650 \text{ kg / m}^3$, $s = 2.59$, $h = 2.5 \text{ m}$, $d_{50} = 0.20\text{mm}$, $H_r = k_s = 100 \times d_{50}$, $w_s = 0.025\text{m / s}$, $k = 0.4$.

OR

- Q12)**a) Determine the sediment transport rate along a coast for the following conditions. $H_0 = 5\text{m}$, $T = 12\text{sec}$. Angle of wave approach in deep waters $\alpha_0 = 30^\circ$ and breaker index $K_i = 0.78$. [6]
- b) What is Littoral drift? Explain how it occurs with neat diagrams. [6]
- c) What is onshore and offshore transport and sediment effects on it. [6]

