Total No. of Questions : 12]

SEAT No. :

P3554

[Total No. of Pages : 4

[4859] - 28

B.E. (Civil)

WAVE MECHANICS

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data if necessary.***

SECTION - I

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

b) Write a short note on wave rider buoy. **[4]**

c) Obtain the values of significant wave height and period in deep water generated by a wind (corrected) speed of 24.2 m/s and lasting for 3 hours over a fetch of 100 km. State whether the sea is fetch controlled or duration controlled. Use SMB curves. **[8]**

OR

Q2) a) Define fully developed sea, partially developed sea, swell. **[6]**

b) Discuss the process of wave generation. **[4]**

c) Discuss the corrections required to be done in wind velocity measured 10 m above mean sea level. **[6]**

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Q3) a) Obtain expression for pressure below sea surface. **[6]**

b) Draw a figure showing relative profiles of linear, Stokian, Cnoidal and solitary waves in a single sketch. **[4]**

c) A wave with a period of 8 sec in a deep water depth of 15 m and significant wave height of 5.5 m. Find the local horizontal and vertical velocities and accelerations at an elevation of Z = –5 m below the SWL when $\theta = 60°$. **[8]**

OR

Q4) a) Prove that water particle displacement follows the elliptical profile. **[6]**

b) State all assumptions of a wave theory. What are additional assumptions for a linear wave theory. **[4]**

c) A wave with period of 10 sec and significant wave height of 2.5 m moves towards the shore normal to the sea bed contour. Obtain the rate at which energy per unit width is transported towards the shoreline. Find total energy delivered in 2 hours. **[8]**

Q5) a) Write short note on uses of wave spectra. **[6]**

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

Q6) a) Distinguish between short term analysis-long term analysis, probability density function-probability distribution function, stationary process-ergodic process, autocorrelation function-spectral density function. **[10]**

b) Write short note on JONSWAP method. **[6]**

SECTION - II

Q7) a) Derive assumption in the theory of refraction. **[6]**

b) What is wave breaking? Discuss with respect to interaction with current and solitary theory. Discuss various ways of wave breaking. **[6]**

c) Write in brief about wave reflection. **[6]**

OR

Q8) a) A wave has 3m height and 7 seconds period in deep water. It travels towards shore over parallel bed contours. If its crest line makes an angle of 30 with the bed contour of 10 m before refraction. Calculate the wave height after crossing this contour line. **[10]**

b) Write short note on wave set up and set down. **[8]**

Q9) a) Draw Minikin's wave pressure diagram. State formula for total breaking force on wall and total moment about toe. **[8]**

b) What is effect of angle of wave approach on breaking or broken waves? Discuss effect of non-vertical walls on breaking and broken wave forces. **[8]**

OR

Q10) a) Draw sketches for pressure distribution of non breaking wave forces when crest appears on the wall and trough appears on the wall. **[8]**

b) For a smooth faced vertical wall the incident wave height is 2.5 m and depth at the structure of the toe is 3 m. For a wave period of 9 sec find the height of the clapotis crest and trough above the bottom (yc and yt) **[8]**

Q11) a) Write in brief about calculation of wave forces using Dean's theory. **[10]**

b) A one meter jacket leg is subjected to an attack of waves which are 4 m high, 55 m long and 7 seconds in peirod. Determine the maximum drag force, maximum Inertia force, Total Force at $\theta = \pi / 4$ at a location 8 m below SWL. The water depth is 60 m. Take $C_D = 1$, $C_M = 2$, $\rho = 1030$ kg/m^3. Use linear theory. **[6]**

OR

Q12) a) Derive equation for variation of drag force along the total member length of vertical member. **[8]**

b) Discuss effect of roughness on C_D and C_M. **[4]**

c) Write short note on wave slam. **[4]**

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