

**Department of Ocean Engineering and Naval Architecture**

**Date: 21 February, 2015 (FN)      Time: 2 Hrs      Full Marks: 30**  
**Mid-Spring Semester Examination      Sub No. NA60022**  
**IV year B.Tech(H) / M.Tech      Subject: Ocean Circ. & Wave Modeling**

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**Answer ALL the questions**

**All questions carry equal marks**

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1.(a) What are the various types of wind fields above the ocean surface? Explain in detail the various wind types providing suitable mathematical expression for the same?

**[2+3]**

(b) Explain the features of the marine boundary layer (MBL) and how is it parameterized? What are the general inconsistencies noticed in the parameterization aspects of MBL?

**[2+3]**

2 (a) Describe the action density equation used in wave modeling? Provide details of appropriate mathematical expression for various physical parameterizations used as source and sink mechanisms in the energy balance equation applicable to a third generation wave model?

**[6]**

(b) What are the various types of ocean wave spectra? Explain the role of non-linear wave-wave interaction in shallow waters, and how do they change the shape of the spectral peak?

**[4]**

3 (a) How are cyclones categorized? Provide a mathematical formulation for the cyclostrophic wind equation? Is geostrophic approximation applicable for a cyclonic flow, and if so, why?

**[2+2+1]**

(b) Explain the first, second, and third generation wave models? How are they different; and what are the relevant aspects addressed in third generation wave model applicable for wave hindcast/forecast?

**[2+3]**