Indian Maritime University
Visakhapatnam Campus

Course: B.Tech / (NA & OE) / 1st Year **Date: 20.12.12**
Subject: Chemistry
Sub.Code: NA1003 **Time: 1000-1300Hrs**
Hours: 3Hrs

END SEM EXAM 2011

A) ATTEMPT ALL QUESTIONS: (5x2=10)

1. What are the different segments of environment?

2. Define bath chromic shift and hypsochromic shift.

3. What is the importance of pH in boiler feeder water.

4. Explain MOT diagram of oxygen and boron.

5. What is the importance of Montreal protocol.

B) ATTEMPT ANY FIVE QUESTIONS: (5x4=20)

1. Define:
   i) Pour point
   ii) Upper flammable limit
   iii) Viscosity
   iv) Auto ignition temperature

2. Give the construction, working and reactions involved in a dry cell.

3. Define paint. Give composition of paints.

4. Give the source ,control and effect of acid rain and lead pollution.

5. Give two statements for 2nd law of thermodynamics .

128 gms of oxygen are compressed from a pressure of 1atm. to 8 atm. at 27^{0}C. Calculate the change in entropy for the process, assuming the oxygen to be an ideal gas. (R=8.3J/degree/mole.)

6. What is stereoisomerism? Explain optical activity of lactic acid and tartaric acid.

C) ATTEMPT ANY TWO QUESTIONS: (2x10=20)

1. What are the factors influencing corrosion. Explain different types of corrosion.
2. Explain principle and applications of U.V Spectroscopy.

3 What are the assumptions of crystal field theory. Discuss the crystal field splitting in tetrahedral complex. What are the factors affecting stability of complexes.

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Course: B. Tech / (NA & OE) / 1st Year
Subject: Performance of Marine Vehicles-I
Sub. Code: NA 50007

Date: 07.12.2011
Time: 10.00 – 1.00
Max. Marks: 100

I SEM END EXAM 2011

Answer **five** questions.

Density of fresh water = 1000 kg per m^3. Density of sea water = 1025 kg per m^3.
Acceleration of gravity = 9.81 m per sec^2.

1. A ship of length 144 m has a wetted surface of 4700 m^2. In a resistance test with a model of length 4 m, the resistance R_{TM} at various speeds V_M is found to be as follows:

V_M, m/s :	0.857	1.029	1.200	1.372	1.543
R_{TM}, N :	5.559	7.971	11.083	15.211	20.849

Determine the effective power of the ship as function of speed using the ITTC friction line $C_f = 0.075(\log_{10} R_n - 2)^{-2}$ with a form factor $1+k=1.085$ and a roughness allowance of 0.4×10^{-3}. The kinematic viscosities of fresh water and sea water are 1.139×10^{-6} and 1.188×10^{-6} m^2 per sec respectively.

2. (a) Explain with the help of sketches what you understand by the pitch ratio, expanded blade area ratio, blade thickness fraction, boss diameter ratio, rake and skew of a propeller.

(b) A four bladed propeller of diameter $D = 6$ m has the following distribution of expanded blade widths (chords) c at different radii r, R being the propeller radius:

r/R :	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
c/D :	0.1568	0.1814	0.2026	0.2201	0.2310	0.2300	0.2176	0.1818	0

Calculate the expanded blade area ratio of the propeller.

3. (a) Describe the blade element theory of propellers.

(b) A propeller of 3.0 m diameter has a thrust of 200 kN at a speed of advance of 6.0 m per sec. Determine the ideal efficiency of the propeller. What is the mass of water flowing through the propeller disc per unit time?

4. (a) Show by dimensional analysis that the torque coefficient is a function of the advance coefficient, the Reynolds number, the Froude number and the Euler number (pressure coefficient). Explain how the thrust and torque coefficients are usually regarded as functions of only the advance coefficient.

(b) A propeller of diameter 4 m and pitch ratio 1.0 has open water characteristics as follows:

J :	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
K_T :	0.4250	0.3984	0.3689	0.3365	0.3013	0.2631	0.2221	0.1782	0.1314	0.0818
$10K_Q$	0.5994	0.5698	0.5357	0.4971	0.4540	0.4064	0.3543	0.2977	0.2365	0.1708

Determine the propeller thrust, open water efficiency and speed of advance when the propeller runs at 120 rpm and has a torque of 125 kN m.

5. (a) Explain the terms : wake fraction, thrust deduction fraction, relative rotative efficiency, thrust identity and torque identity.

(b) A ship has an effective power of 6000 kW at a speed of 16 k. This speed is achieved when the engine has a brake power of 9000 kW and the propeller rpm is 150. The wake fraction is 0.200, the thrust deduction fraction is 0.170, the relative rotative efficiency is 1.030 and the shafting efficiency is 0.980. Determine the open water efficiency of the propeller.

6. (a) Describe the phenomenon of propeller cavitation and its harmful effects. What steps can be taken during propeller design to minimize the risk of cavitation?

(b) A propeller of diameter 2.5 m, pitch ratio 0.8 and expanded blade area ratio 0.55 has its axis 1.5 m below the surface of water. The propeller is designed to run at an advance coefficient of 0.600 and a thrust coefficient of 0.125. If the propeller begins to cavitate at 180 rpm, determine the minimum cavitation number based on speed of advance to avoid cavitation and the corresponding thrust per unit projected blade area. Atmospheric pressure is 101.325 kN per m^2 and vapour pressure is 1.704 kN per m^2. The ratio of projected blade area to expanded blade area is $1.067 - 0.229\ P/D$, where P/D is the pitch ratio.

7. (a) Discuss the advantages and disadvantages of controllable pitch propellers.

(b) The open water characteristics of a ducted propeller of 3 m diameter and 1.0 pitch ratio are as follows :

J	:	0	0.2	0.4	0.6	0.8
K_T	:	0.486	0.390	0.290	0.175	0.032
K_{TD}	:	0.247	0.159	0.088	0.022	-0.072
$10K_Q$	:	0.402	0.389	0.354	0.287	0.220

K_T is the thrust coefficient of the propeller and duct together and K_{TD} is the thrust coefficient of the duct alone. If the propeller runs at a constant 102.88 rpm, determine the thrust and torque of the propeller and the duct thrust at speeds of advance of 0, 2, 4 and 6 knots. At what speed of advance will the duct thrust be zero?

8. (a) Describe the different types of foil arrangements and foil types used in hydrofoil craft.

(b) A hovercraft has a weight 2000 kN and a speed of 50 k. Its air cushion is rectangular and has a length breadth ratio of 2. If the cushion pressure is 2.5 kN per m^2 above atmospheric pressure, determine the length and breadth of the air cushion. Air leaks out through the gap between the air cushion skirts and the surface of water at the rate of 1 kg per sec for every metre of the cushion perimeter. Determine the momentum drag of the hovercraft.

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