

L-1/T-1/NAME

Date : 27/06/2011

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2009-2010

Sub : **NAME 117** (Hydrostatics and Stability)

Full Marks: 210

Time : 3 Hours

The figures in the margin indicate full marks.

Assume reasonable Value for any Missing DATA

USE SEPARATE SCRIPTS FOR EACH SECTION

**SECTION – A**

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) What is launching diagram? How do you get necessary information for plotting curves of launching diagram? (10)

(b) Construct a launching diagram for a ship having the following particulars and launched from a cambered ways. Determine also the travel of ship at which the stern lifts and minimum moment against tipping. (25)

Length of ship = 134 m

Length of ways = 152 m

Length from fore poppet to forward perpendicular = 4.50 m

Declivity of keel = 4.7 cm per metre

The following information is available:

Travel (m)	61	76	91.5	107	122
Buoyancy (Tonne)	640	1,350	2,484	3,922	5,730
Moment of 'B' about way ends (tonne-m)	-	23,800	67,240	146,700	273,316

Declivity of ways = 5.55 cm per metre

Camber of ways = 30.48 cm in 152 m

Water over way ends = 0.8 m

Height of Underside of keel above water level at Aft perpendicular = 1.20 m

Displacement of ship = 16530 tonne, Launching weight = 4260 tonne, Assume C. G. of ship 3.0 m aft of amidships.

2. A bulk carrier has the following characteristics: (35)

Length ( $L_{BP}$ ) = 150m

Depth (D) = 11.75m

Beam (B) = 22.00m

$C_B$  at 0.85 D = 0.6426

Freeboard Length (L) = 152.61 m

The effective length of superstructure and trunks has been calculated to be 0.22(L) and it is of standard height. there is no sheer on freeboard deck.

Calculate the freeboard and the corresponding maximum summer load draft for this design. Ship is 'B Type'. From the given data also calculate the moulded displacement at this draft.

Contd . . . . . P/2

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**Contd . . . . . Q. No. 2**

The following information is given from the load line Rules:

**Tabular Freeboard**

Length of ship (m)	Freeboard (mm)
149	2293
150	2315
151	2336
152	2354
153	2375

Deduction of Effective Length of Superstructure and Trunk.

Effective length	0.1(L)	0.2(L)	0.3(L)
% Deduction	6.3	12.7	19

For effective length 1.0(L). The deduction is - 1070 mm.

- 3. (a) Describe the ways to calculate the draft using 'Lost Buoyancy' Method. **(15)**  
(b) A vessel of constant rectangular cross-section is 46m long 11m beam, and floats on an even keel draft of 1.82 m. A compartment 15.25 m long at amidships is bilged. Find the effects of this on initial stability using the lost buoyancy method. The value of KG before bilging is 1.82m. **(20)**
- 4. (a) Determine the expressions for draft at AP and F.P. as the ship enters the water for ways with Camber. What are the effects of Camber? **(15)**  
(b) Write short notes on the following: **(20)**
  - (i) Load line Mark
  - (ii) IMO Stability Requirements
  - (iii) Net Tonnage and Gross Tonnage
  - (iv) Light weight and Dead Weight

**SECTION – B**

There are **FOUR** questions in this Section. Answer any **THREE**

Assume any suitable values for missing data..

- 5. (a) Give the definition of: **(10)**
  - (i) Displacement
  - (ii) Block coefficient
  - (iii) Midship coefficient
  - (iv) Prismatic coefficient
  - (v) Water plane area coefficient

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**Contd . . . . . Q. No. 5**

- (b) State and prove 5, 8, -1 rule. (12)
- (c) A curvilinear area has ordinates 3 m apart of length 9.7, 10.5 and 14.1 m respectively. Find (13)
- (i) The area between the first and second ordinates.
- (ii) The area between the second and third ordinates
- (iii) Check the addition of these results by finding the area of the whole figure by Simpson's first rule.
6. (a) What is the center of buoyancy? (5)
- (b) State and prove the Morrish's or Normend's approximate formula for the distance of the center of buoyancy below the L.W.L. in terms of draught, block coefficient and water plane area coefficient. (20)
- (c) Calculate the distance of the center of buoyancy of a vessel below the LWL having 6.1 m mean moulded draught, block coefficient of displacement 0.55 and coefficient of water plane 0.7. (10)
7. (a) Define the center of flotation, Metacentric height and statical stability. (6)
- (b) Derive the expression for righting lever of a wall-sided vessel. (20)
- (c) A wall-sided vessel has GM of 5m and BM = 10m. Determine the value of righting lever at 5°, 10° and 15°. (9)
8. (a) The semi ordinates of a waterplane of a ship 12.1 m apart are 0.11, 4.8, 8.8, 11.5, 12.2, 12.3, 12.3, 12.1, 11.8, 9.4 n respectively. Calculate (35)
- (i) Area of water plane.
- (ii) Center of flotation.
- (iii) Transverse KM
- (iv) Longitudinal KM
- (Volume of displacement up to the water plane 17212 Tonne and center of buoyancy from Keel 3.5 m.)
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BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **MATH 181** (Differential Calculus and Integral Calculus)

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

**SECTION – A**There are **FOUR** questions in this Section. Answer any **THREE**.

Symbols have their usual meanings.

1. (a) Test the continuity and differentiability of  $f(x)$  at  $x = \pi/2$  when  $f(x)$  is defined as follows: (12)

$$f(x) = \begin{cases} 1, & x < 0 \\ 1 + \sin x, & 0 \leq x < \pi/2 \\ 2 + (x - \pi/2)^2, & x \geq \pi/2 \end{cases}$$

- (b) Find the  $n$ -th derivative of  $y = x^3 e^x \cos^3 x$ . (12)

- (c) If  $x = \sin\left(\frac{\log y}{m}\right)$  then show that  $(1 - x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + m^2)y_n = 0$  and also

find  $y_n$  when  $x = 0$ . (11)

2. (a) State and prove Rolle's theorem. (13)

- (b) Expand  $\sin x$  in powers of  $(x - \pi/2)$ . (10)

- (c) Evaluate: (i)  $\lim_{x \rightarrow 0} \left( \frac{1}{x^2} - \frac{1}{\sin^2 x} \right)$  (ii)  $\lim_{x \rightarrow 0} \left( \frac{1}{x} \right)^{\sin x}$  (12)

3. (a) If  $u = \log \sqrt{x^2 + y^2 + z^2}$  then show that  $(x^2 + y^2 + z^2) \left( \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} \right) = 1$ . (12)

- (b) Divide number 50 into two parts such that the product of the cube of one and the square of the other shall be a maximum. (12)

- (c) Show that the two curves  $2y = x^2$  and  $2x^2 y = 1$  should cut orthogonally at  $(1, 1/2)$ . (11)

4. (a) Find the centre of curvature of the curve  $xy = 12$  at the point  $(3, 4)$ . (10)

- (b) Find the equation of the circle of curvature at the point  $(3, 1)$  on the curve  $y = x^2 - 6x + 10$ . (10)

- (c) Obtain all asymptotes of the curve  $x^3 + 3x^2 y - 4y^3 - x + y + 3 = 0$ . (15)

**MATH 181(NAME)**

**SECTION - B**

There are **FOUR** questions in this Section. Answer any **THREE**.

5. Carryout the following:

(a)  $\int \frac{dx}{\cos(2x-a)\cos(2x+a)}$  (12)

(b)  $\int \frac{dx}{x\sqrt{1+x^3}}$  (11)

(c)  $\int e^x \left( \frac{1+\sin x}{1+\cos x} \right) dx$  (12)

6. (a) Find a reduction formula for  $\int (\cos^{-1} x)^n dx$ . (10)

(b) Evaluate the following:  $\int_0^{\pi} \frac{x \tan x}{\sec x + \tan x} dx$ . (13)

(c) Find the value of:  $\int_1^{\infty} \frac{\tan^{-1} x}{x^2} dx$ . (12)

7. (a) Define Gamma and Beta function.

Evaluate:  $\int_0^1 \frac{x^2 dx}{\sqrt{1-x^4}} \times \int_0^1 \frac{dx}{\sqrt{1+x^4}}$ . (2+18)

(b) Prove that the area of the curve  $a^4 y^2 = x^5 (2a - x)$  to that of a circle of radius 'a' is 5 : 4. (15)

8. (a) Find the perimeter of the loop of the curve  $3ay^2 = x(x - a)^2$ . (12)

(b) Find the volume of the solid generated by the revolution of  $r = 2a \cos\theta$  about the initial line using integration. (10)

(c) Find the surface area of the solid generated by revolving the cycloid  $x = a(\theta - \sin\theta)$ ,  $y = a(1 - \cos\theta)$  about the x-axis using integration. (13)

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**SECTION – A**

There are **FOUR** questions in this Section.

Answer any **THREE** including Question No. 1 as compulsory

1. (a) Explain with reference to the context any one of the following: (08)
- (i) "She danced with enthusiasm, with passion, in a kind of cloud of happiness that came of all this."
  - (ii) "On my part it was the caprice of a pampered man, and on his part simple greed for money."
- (b) Answer any one of the following: (10)
- (i) "Matilda suffers as she wants to transcend the lower middle class barrier."— Discuss.
  - (ii) Do you agree with the Lawyer that we human beings are simply running after illusion?
- (c) Answer any three of the following: (12)
- (i) What impression do you get about the banker in the story "The Bet"?
  - (ii) "We were so moved that we all wept for happiness." — Who were moved and why?
  - (iii) Why did Matilda utter a cry of joy in the midst of her poverty?
  - (iv) Who, in your opinion, actually won the bet?
  - (v) How did Circe exercise her magic power?
2. Recast and correct any ten of the following sentences: (20)
- (i) What for did you go there?
  - (ii) "My Life" is the biography of Bill Clinton.
  - (iii) Jamil was an alumna of BUET.
  - (iv) Salma, you and I should be there in time.
  - (v) I like to swim, playing tennis, and riding.
  - (vi) The cluster of grapes are thick.
  - (vii) The players are going to repeat the performance again.
  - (viii) He would not help us in any way, shape, or form.
  - (ix) I shall try and come to your party.
  - (x) They can't hardly speak English.
  - (xi) There is a few points to be made in this argument.
  - (xii) We shall combine the three departments into one.

**HUM 111**

3. (a) Give the meaning of any ten of the following words: (10)

aggravate, luminous, mundane, cabal, grouchy, homage, versatile, deprecate, clemency, pauper, sever, erudite.

- (b) Make sentences with any ten of the following words: (10)

exorbitant, bellow, flounder, entice, prolific, sinuous, jeopardy, vanity, object, hoax, emulate, tepid.

4. Write a précis of the following passage with a suitable title: (20)

People moan about poverty as a great evil; and it seems to be an accepted belief that if people only had plenty of money, they would be happy and useful and get more out of life. As a rule, there is more genuine satisfaction in life and more obtained from life in the humble cottage of the poor man than in the palace of the rich. I always pity the sons and daughters of a rich man, who are attended by servants, and have governesses at a later age; at the same time I am glad to think that they do not realize what they have missed.

It is because I know how sweet and happy and pure the home of honest poverty is, how free from perplexing care and from social envies and jealousies — how loving and united its members are to the common interest of supporting the family — that I sympathize with the rich man's boy and congratulate the poor man's son. It is for these reasons that from the ranks of the poor so many strong, eminent, self-reliant men have always sprung, and always must spring. If you will read the list of the "Immortals who were not born to die", you will find that most of them have been born poor.

It seems nowadays a matter of universal desire that poverty should be abolished. We should be quite willing to abolish luxury; but to abolish honest, industrious, self-denying poverty would be to destroy the soil upon which mankind produces the virtues that will enable our race to reach a still higher civilization than it now possesses.

## HUM 111

### SECTION – B

There are **FOUR** questions in this Section.

Answer any **THREE** including Question No. 5 as compulsory.

5. Read the following passage carefully and answer the questions that follow:

(30)

Teaching English to the native people of Bangladesh is not at all an easy task. In school, the traditional grammar-translation method is followed so that the students can only develop their reading and writing skills. But they cannot speak or understand English by listening. So a direct method which gives stress to listening and speaking has been evolved. The teacher has to draw pictures, act to create a situation and has to show model or real object. It is creating a bond between experience and expression. It is time consuming because the teacher has to create a situation of English speaking environment which is a tiresome task. We also know that every language has a definite structural pattern and in essential English, there are 282 structures. The teacher has to analyse the sentences and find out the structure, which is new. Following the structure, the teacher gives several examples. Then he goes for oral drill and invites more examples from the students. This process also gives emphasis to some written works like making sentences using the substitution tables. But when the oral drill goes on, the class becomes noisy and sometimes limited to a particular pattern. It is mechanical and monotonous. So, communicative approach has evolved where through asking questions and responding between the teacher and the class taken place as a two-way process. Audio Lingual approach also has evolved as a modern concept where there is a scope to follow the English speaker to improve listening and speaking skills as well as pronunciation through the cassettes. Teacher should know all the methods. The blending of approaches is the teacher's own creativity.

Questions:

- (i) Why is teaching English to native people of Bangladesh not at all an easy task?
- (ii) What are the methods mentioned in the passage?
- (iii) In essential English, how many structural patterns are there?
- (iv) What are the negative sides of oral drill?
- (v) What are the benefits of Audio-Lingual approach?

Contd ..... P/4



**HUM 111**

6. (a) Suppose you are an Assistant Engineer of NAVANA LIMITED. Recently you have bought ten computers from FLORA LOMITED. But two of them have been found defective. Now write a letter of complaint for the replacement. (10)
- (b) Write phonetic transcription of the following words (any five). (10)
- Colour, civil, drink, flood, copy, build, deep.
7. (a) Write a dialogue between you and your friend about the causes and remedies of road accident. (10)
- (b) Write a short essay on any one of the following topics. (10)
- (i) Importance of naval transportation in riverine Bangladesh.
- (ii) Eve-teasing
- (iii) Dhaka city at Mid-night.
8. (a) Transform the following sentences as directed (any five) (10)
- (i) We achieved victory in December, 1971 (complex)
- (ii) They went out leaving us (Compound)
- (iii) Sumon was rewarded as he performed well (Simple)
- (iv) He is a rich man but does not help the poor (Complex)
- (v) The patient was very weak and he cannot speak (Complex)
- (vi) We enjoyed a firm which was interesting (Simple)
- (b) Write short notes on any two of the following. (10)
- (i) Tender Notice
- (ii) Diphthongs
- (iii) Forwarding letter.
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**SECTION – A**

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) What is primitive cell? Draw the primitive cell for body centred cubic crystal structure. (07)
- (b) Draw different types of orthorhombic Bravais lattices mentioning their lattice points per unit cell. (09)
- (c) Define packing factor for a crystal structure. Find the packing factor of a body centred cubic and face centred cubic crystal considering atoms as sphere. (13)
- (d) The structure of iron changes from body centred cubic to face centred cubic at certain temperature. Calculate the ratio of packing factors of bulk iron in the two structures considering the atomic radius remains unchanged during transition. (06)
  
2. (a) What are Miller indices? Draw the crystal planes having Miller indices (100), ( $\bar{1}00$ ) and (200). (12)
- (b) Find the expression for interplanar spacing in terms of lattice parameters and Miller indices for a tetragonal crystal structure. (14)
- (c) If the lattice constant of a cubic crystal is 0.40 nm, calculate the spacing between (011), (101) and (112) crystal planes. (09)
  
3. (a) Briefly discuss various types of x-ray diffraction methods. (09)
- (b) Explain Schottky and Frenkel type imperfections in crystals. Write down some of the importance of imperfections in solid materials. (09)
- (c) What is cohesive energy? Find the cohesive energy per atom for rocksalt if the equilibrium distance between ions is 0.281 nm. Here ionization energy for  $\text{Na}^+$  is + 5.14 eV and electron affinity for  $\text{Cl}^-$  is – 3.61 eV. (12)
- (d) Distinguish between conductors, semiconductors and insulators in terms of energy band concept. (05)
  
4. (a) State Gauss' law of electricity. Find out the coulomb's law from Gauss' law. (10)
- (b) Derive an expression for electric potential due to a disc of charge. (13)

**PHY 105****Contd ... Q. No. 4**

(c) Consider a parallel -plate capacitor of plate area  $115 \text{ cm}^2$  and plate separation  $1.24 \text{ cm}$ . A potential difference  $85.5 \text{ V}$  is applied between the plates. The battery is then disconnected and a dielectric slab of thickness  $0.780 \text{ cm}$  having dielectric constant  $2.61$  is placed between the plates: (12)

- (i) What is the capacitance of the capacitor before the slab is inserted?
- (ii) Calculate the free charge appears on the plates.
- (iii) What is the electric field in the dielectric slab?
- (iv) What is the potential difference between the plates after the slab has been introduced?

**SECTION - B**

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Explain drift speed of electrons. (8)  
 (b) What is Hall effect? Derive an expression to find the number of charge carriers per unit volume. (17)  
 (c) A copper strip of  $2.5 \text{ cm}$  wide and  $1.5 \text{ mm}$  thick is placed in magnetic field of  $1.5 \text{ W/m}^2$ . If a current of  $200 \text{ A}$  is set up in the strip, what potential difference appears across the strip? Calculate the number of charge carriers per unit volume of the strip. (10)
  6. (a) What are spin and magnetic dipole moment of an electron? Explain the term Bohr magneton. (10)  
 (b) Why some materials show magnetic behavior? Describe the hysteresis loop and explain the term hysteresis residual magnetisation and coercive force.  
 (c) A compass needle made of pure iron (with density  $8100 \text{ kg/m}^3$ ) has length  $3 \text{ cm}$ , width  $1 \text{ mm}$ , and thickness  $0.50 \text{ mm}$ . The magnitude of the magnetic dipole moment of an iron atom is  $2.1 \times 10^{-23} \text{ J/T}$ . If the magnetization of the needle is equivalent to the alignment of  $15\%$  of the atoms in the needle, what is the magnitude of magnetic dipole moment of the needle? (10)
  7. (a) What is Compton effect? Derive the relation for change in wavelength in Compton scattering. (20)  
 (b) What are the experimental characteristics of photo-electric effect? (8)  
 (c) X-rays of  $\lambda = 2.30 \text{ \AA}$  are scattered from a Carbon block. The scattered radiation is viewed at  $90^\circ$  to the incident beam. (7)  
    - (i) What is the Compton shift ( $\Delta\lambda$ )?
    - (ii) What is the fractional photon energy change?
    - (iii) What kinetic energy is imparted to the recoiling electron?
  8. (a) Derive an expression for the relativistic kinetic energy of a particle. (10)  
 (b) Define nuclear fission. What do you mean by Q-value of nuclear reaction? Derive an expression for the Q-value of a nuclear reaction  $X(x, y) Y$  in a laboratory co-ordinate system. Consider the atomic and particle masses are  $M_x, m_x, M_y$  and  $m_y$ , respectively. (18)  
 (c) Consider the following fission reaction: (7)  

$$^{235}\text{U} + n \rightarrow ^{95}\text{Mo} + ^{135}\text{La} + 2n + Q.$$
 The masses of the neutron,  $^{235}\text{U}$ ,  $^{95}\text{Mo}$  and  $^{139}\text{La}$  are  $1.008665 \text{ u}$ ,  $235.043923 \text{ u}$ ,  $94.905842 \text{ u}$  and  $138.906348 \text{ u}$ , respectively. Calculate the Q-value in MeV, for this fission reaction.
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