

The figures in the margin indicate full marks.

Symbols have their usual meanings.

USE SEPARATE SCRIPTS FOR EACH SECTION

**SECTION – A**

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

1. Workout the following:

(a)  $\int \frac{x^2 - 1}{x^4 + x^2 = 1} dx$ ,      (b)  $\int \sin^{-1} \sqrt{\frac{x}{x+a}} dx$       (c)  $\int \frac{dx}{x^{1/2} + x^{1/4}}$       **(15+15+16 $\frac{2}{3}$ )**

2. (a) Use Fundamental theorem to evaluate  $\int_0^{\pi/2} \ln(\sin x) dx$       **(12 $\frac{2}{3}$ )**

(b) Evaluate:  $\lim_{n \rightarrow \infty} \left[ \frac{1}{\sqrt{n^2 - 1}} + \frac{1}{\sqrt{n^2 - 2^2}} + \frac{1}{\sqrt{n^2 - 3^2}} + \dots + \frac{1}{\sqrt{2n - 1}} \right]$       **(13)**

(c) (i) Establish a relation between gamma function and beta function.      **(13)**

(ii) Prove that  $\int_0^{\infty} x^{3/2} e^{-4x} dx = \frac{3\sqrt{\pi}}{128}$ .      **(8)**

3. (a) Evaluate the following:  $\int_0^{16} \frac{x^{1/4}}{1 + x^{1/2}} dx$       **(10)**

(b) Apply Trapezoidal's and Simpson's  $\frac{1}{3}$ rd rule to calculate an approximate value of

$\int_0^1 \frac{1}{x+1} dx$  by taking seven equidistant ordinates. Compare the results with its exact value.

**(20)**

(c) Find the whole arc length of the curve  $x(a^2 - x^2) = 8a^2 y^2$ .      **(16 $\frac{2}{3}$ )**

4. (a) Find the larger area enclosed by the curves  $x^2 + y^2 = 64a^2$  and the parabola  $y^2 = 12ax$ .      **(18)**

(b) Find the intrinsic equation of  $r = a(1 - \cos \theta)$  when the arc length is measured from one cusp (where  $\theta = 0$ ).      **(14)**

(c) Find the volume of the solid formed by the revolution of one arch of the cycloid  $x = a(\theta - \sin \theta)$ ,  $y = a(1 - \cos \theta)$  about its base.      **(14 $\frac{2}{3}$ )**

**MATH 163(ME)****SECTION – B**

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

5. (a) Find the differential equation of the family of circles of variable radii  $r$  with centers on the  $x$ -axis. (12 $\frac{2}{3}$ )
- (b) Solve the differential equation  $(x + y + 1) dx + (2x + 2y + 1) dy = 0$ . (16)
- (c) Define integrating factor. Find an integrating factor of the differential equation  $(2 + y^2) dx - (xy + 2y + y^3) dy = 0$  and solve as well. (18)
6. (a) Define exact differential equation. Make the differential equation  $y(2xy + 1) dx + x(1 + 2xy - x^3 y^3) dy = 0$  to exact and solve it. (15)
- (b) Five mice in a stable population of 500 are intentionally infected with a contagious disease to test a theory of epidemic spread that postulates the rate of change in the infected population is proportional to the product of the number of mice who have the disease with the number that are disease free. Assuming the theory is correct, how long will it take half the population to contract the disease? (16)
- (c) Show that the family of confocal conics  $\frac{x^2}{c} + \frac{y^2}{c - \beta} = 1$ , where  $c$  is an arbitrary constant, is self-orthogonal. (15 $\frac{2}{3}$ )
7. (a) Find the particular integral of the following higher order differential equation:  
 $(D - 1)^3 y = \cos^2 x$ . (15)
- (b) Solve the Legendre's linear equation  
 $(1 + x)^2 \frac{d^2 y}{dx^2} + (1 + x) \frac{dy}{dx} + y = 4 \cos \log(1 + x)$  (16)
- (c) Solve  $(D^3 + 2D^2 - D - 2)y = e^x + x^2$ , using undetermined coefficients. (15 $\frac{2}{3}$ )
8. (a) Solve:  $y \frac{d^2 y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = \frac{dy}{dx}$ . (14)
- (b) Solve the following differential equation by the method of factorization of operator:  
 $[(x + 3)D^2 - (2x + 7)D + 2]y = (x + 3)^2 e^x$ . (18 $\frac{2}{3}$ )
- (c) Determine whether the series converges:  $\sum_{k=1}^{\infty} \frac{1}{\sqrt[3]{2k-1}}$ . (14)
-

L-1/T-2/MME

Date : 22/01/2017

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **CHEM 121** (Organic Chemistry)

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

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**SECTION – A**

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

1. (a) State Huckel rule. Draw the structures of the following and show whether they are aromatic or not. (2+8=10)
  - (i) 1, 3, 5, 7 – Cyclooctatetraene
  - (ii) Cycloheptatriene
  - (iii) Indole
  - (iv) Quinoline
- (b) Describe the various processes for obtaining aromatics from petroleum. (10)
- (c) Discuss the sulphonation and Friedel Craft's Acylation of benzene with mechanism. (5×2=10)
- (d) How will you obtain glyoxal from benzene? (5)
  
2. (a) What is pyridine? Draw the resonance structures and orbital pictures of pyridine. (2+8=10)
- (b) Deduce a tentative structure for pyridine by degradative methods and confirm it by a synthesis. (10)
- (c) Explain with mechanism that pyridine undergoes nucleophilic substitution reaction at position C-2. (9)
- (d) What happens when pyrrole is subjected to mild and catalytic reduction? (6)
  
3. (a) Give the Fischer-Indole synthesis of indole and Skraup's synthesis for quinoline with mechanism. (12)
- (b) Write the structure of thioindigo. How will you obtain thioindigo from anthranilic acid? (7)
- (c) What are pentosans? Starting with pertosan give a synthesis to furfural. (7)
- (d) How would you carry out the following conversions? (3×3=9)
  - (i) 4-Chlorobutanol from tetrahydrofuran
  - (ii) 1, 4-dichlorobutane from tetrahydrofuran
  - (iii) Pyrrolidine from tetrahydrofuran

**CHEM 121**

4. (a) What are alkaloids? Discuss their isolation from plant materials with a flow-diagram. (10)
- (b) Write down the structures of the following alkaloids and classify them on the basis of heterocyclic rings present in their structure. (5×2=10)
- (i) Quinine (ii) Papavarine (iii) Gramine (iv) Nicotine (v) Hygrine
- (c) Mention the reactions that have been postulated for the biosynthetic conversion of aminoacids into alkaloids. (8)
- (d) Describe how the nature of nitrogen groups can be indentified in the structure of alkaloids. (7)

**SECTION – B**

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

5. (a) (i) What is conformation? Describe some conformations of n-butane which arise due to rotations about the central bond with energy profile. (15)
- (ii) Compare the heights of the various energy barriers with each other.
- (b) Draw structures of all products expected from monochlorination at room temperature of (i) n-butane (ii) isobutane (iii) 2,2-dimethyl butane (6)
- (c) Discuss various factors affecting the stability of conformations. (6)
- (d) Draw all possible conformations of 1,2 dimethylcyclohexane. Indicate which one is more stable and state the reason.
6. (a) Explain the effects of polar protic solvents on  $S_N^1$  and  $S_N^2$  reactions. (8)
- (b) Compare  $S_N^1$  and  $S_N^2$  reaction mechanisms with regard to- (15)
- (i) stereochemistry.
- (ii) kinetic order
- (iii) relative rates for  $CH_3X$ , iso- $C_3H_7X$ , tert- $C_4H_9X$ .
- (c) Write down the structures and name of the products obtained from 3-hexyne with: (6)
- (i)  $H_2$ , Ni (ii) Na,  $NH_3$  (liq.) (iii)  $H_2$ , lindlar catalyst
- (d) Why are alkynes more acidic than alkenes and alkynes? (6)
7. (a) Describe  $E_1$  and  $E_2$  mechanisms showing transition state and order of reaction. (10)
- (b) Give structures and name of products expected from the reaction of 3,3-dimethyl-1-butene with: (i) HI (ii) HBr (Peroxides) (iii)  $Cl_2$  (iv)  $Br_2$ ,  $H_2O$  (v)  $H_2SO_4$  (10)
- (c) Show the mechanism of dimerization of isobutylene in presence of  $H_2SO_4$  (8)
- (d) How can you account for the fact that O-nitro phenol has a much lower boiling point and much lower water solubility than it's isomers. (7)

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**CHEM 121**

8. (a) Discuss the effects of electron releasing groups on substitution reactions of aromatic compounds. (7)
- (b) Give outline for the following preparations: (16)
- (i) Preparation of styrene from benzene.
  - (ii) Preparation of m-bromotoluene from toluene.
  - (iii) Preparation of m-bromophenol from nitrobenzene.
  - (iv) Preparation of salicylic acid from phenol.
- (c) Compare the stability of benzyl cation and benzyl free-radical. (5)
- (d) Show the synthesis of aniline from benzamide with mechanism. (7)
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**CHEM 141**

**SECTION – B**

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

5. (a) How would you distinguish between corrosion and erosion? What do you understand by the direct and indirect economic loss due to the corrosion? (3+4=7)
- (b) Discuss the following factors which influence the under water corrosion. (12)
- (i) Temperature (ii) Dissolved salts (iii) Velocity of water.
- (c) Write the chemical reactions involved into the micro biological corrosion and under water corrosion. (10)
- (d) How corrosion can be controlled by electrochemical anodic protection technique? (6)
6. (a) What are the basic raw materials of ceramic wares? Mention the functions of the important additives which are used together with the raw materials. How ceramic products can be classified based on the main field of use? (4+5+6=15)
- (b) Describe the various steps of the industrial manufacturing process of the ceramic articles. (10)
- (c) How clays can be classified based on their deposition and compositions? Explain, how the impurities associated with clay influence the property and quality of the ceramic wares? (5+5=10)
7. (a) What are the basic requirements of a good refractory? Mention the name of the different types of instruments which are constructed by the refractory materials. Why refractory materials have no sharp melting point? (6+4+3=13)
- (b) Describe the industrial manufacturing process of the refractory materials. (10)
- (c) Discuss the following properties of the refractory materials with their important applications. (12)
- (i) Refractoriness (ii) Porosity (iii) Resistance to rapid temperature change (iv) Spalling.
8. (a) What do you mean by sacrificial solid lubricants? Explain the lubricating properties of solid having Laminar and sandwich like structure. "Although the solid lubricants are not common like liquid lubricants but in some cases they are more suitable than liquid lubricants". Justify the statement. (3+8+4=15)
- (b) Discuss the scale and sludge formation in the boiler. What are the disadvantages of scale formation in the boiler? (4+4=8)
- (c) Show by chemical equations how would you prevent corrosion that occurs by corrosive gases, acids and silica. (12)

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **PHY 159** (Waves and Oscillation, Geometrical Optics and Wave Mechanics)

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**.

1. (a) Show that the deviation of an incident beam of light produced by a thin lens is independent of the object position. (10)
- (b) Deduce an expression for the distance between the principal point of equivalent lens and the first lens. When two thin lenses are placed co-axially in air and separated by a distance  $d$ . (15)
- (c) A thin convex lens and a thin concave lens each of 50 cm focal length are co-axially situated and separated by 10 cm. Find the power of the combination. (10)
  
2. (a) What is chromatic aberration in a lens? Deduce the expression for the chromatic aberration in a lens. (10)
- (b) Show the condition for acromatism of two thin co-axial lenses separated by a distance is that the distance between the two lenses must be equal to the mean focal length of the two lenses. (15)
- (c) Two thin convex lenses are co-axially situated and separated by a distance  $d$  have an equivalent focal length 50 cm. The combination satisfies the conditions for minimum spherical aberration and is also achromatism. Assume that both the lenses are of the same material. Calculate the value of  $d$ . (10)
  
3. (a) What is spherical aberration? Show that the spherical aberration for a combination of two convergent lenses is minimum when the distance between the two lenses is equal to the difference of their focal lengths. (10)
- (b) Derive an expression for the resolving power of a microscope. (15)
- (c) Calculate the shape and shape factor of a lens to exhibit minimum spherical aberration when the lens material has a refractive index  $\frac{3}{2}$ . (10)

**PHY 159(ME)**

4. (a) What are damped harmonic oscillations? What is the effect of damping on the natural frequency of an oscillator? Which type of damping motion should be set in door closure? (10)
- (b) If the mass of the spring  $M_s$ , is not negligible but small compared to the mass of the object suspended from it, then show that the time period of the simple harmonically oscillating spring is (15)

$$T = 2\pi \sqrt{\frac{M + \frac{M_s}{3}}{k}}$$

where the symbols have their usual meanings. From the above equation, mention the effect of spring mass in the oscillation.

- (c) Suppose we have a block of unknown mass and an ideal spring of unknown force constant. Show how we can predict the period of oscillation of this block-spring system simply by measuring the extension of the spring produced by attaching the block on it? (10)

**SECTION – B**

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

5. (a) What are phase velocity and group velocity? Find the relation between them. When does the group velocity become equal to the phase velocity? (10)
- (b) Two oscillating bodies of mass  $m_1$  and  $m_2$  are connected by a spring on a horizontal frictionless surface. Show that their relative motion can be represented by the oscillation of single body having reduced mass  $\mu$ . (18)
- (c) Two masses  $m_1 = 1$  kg and  $m_2 = 2$  kg are connected by a spring and oscillating on a horizontal frictionless surface. Find the frequency of the two body system. Given that the extension of the spring is 1 cm for the applied force of 2 N. (7)
6. (a) What are reverberation and reverberation time? What are the requirements of a good auditorium? (8)
- (b) What are the assumptions of Sabines? Deduce expressions for growth and decay of intensity of sound in a room and hence find an expression for reverberation time. (20)
- (c) A room has dimensions 10 m × 8 m × 4 m. The room is made of concrete and contains 70 wooden seats. There are 70 people in the room. Absorption coefficient of concrete is 0.02. Absorbing power per wooden seat = 0.4 Sabine, and per person = 0.25 Sabine. Calculate the reverberation time of the room. (7)



**PHY 159(ME)**

7. (a) What is meant by the terms identical and indistinguishable? (5)
- (b) Distinguish between Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics. Explain Bose-Einstein condensation. (10)
- (c) A one dimensional simple harmonic oscillator is in equilibrium with a heat reservoir at absolute temperature  $T$ . Find out an expression for mean energy and then discuss the results in the limiting cases of high and low temperatures. (20)
8. (a) What is operator? Find out the expressions of momentum and energy operator. (6)
- (b) Derive the equation for normalized wave function of a particle trapped in a box with infinitely hard walls. Discuss the probability of finding the particle at different quantum states. (22)
- (c) A measurement establishes the position of an electron with an accuracy of  $1.00 \times 10^{-11}$  m. Find the uncertainty in the electron's position 1.00 s later. Assume velocity of electron is much smaller than the velocity of light. (7)
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BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **ME 171** (Computer Programming Language)

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**.

1. (a) Make comparisons between: (12)
- (i) CISC and RISC CPUs
- (ii) Compiled and Interpreted Programming Languages.
- (b) Why is the concept of 'computing platform' necessary for a programmer? (8)
- (c) What are the main software modules that are provided by an IDE to a programmer? (8)
- (d) Write a C program in which the '*main*' function calls a user-defined function called '*max*' which then returns the maximum of two local integer variables of the function '*main*'. (7)
2. (a) Explain 'scope' of different types of variables which are used in C programs. (8)
- (b) Write a C program which receives an integer number 'n' from the user and create a float array called 'bodyweights' with dimension 'n'. The program then asks for 'n' number of float (bodyweights) values from the user. It will then calculate and print the average (bodyweights) value on the display. (12)
- (c) Write a C program which will get the percentage of marks obtained in a job recruitment test by five candidates from an input file called '*marks.txt*' [show a sample text file with candidates' roll (1 – 5) on the first column and corresponding marks on the second column]. (15)
3. (a) State whether the following array declarations are valid or not and explain why: (6)
- ```
float x[5.0];
int i[ ][2][3][5];
int k[ ][ ][3][5];
```
- (b) (i) State how the value of the 7<sup>th</sup> element of a 10-element integer array with its arrayname 'a' can be accessed using pointer notation. (3)
- (ii) A structure is defined as follows: (9)
- ```
struct Grades
{
    int roll_no;
    float gpa;
    char letter_grade[2];
};
```

**ME 171**

**Contd ... Q. No. 3(b)**

Make C statements (i) to create an array 'ME171[180]' of Grade type and a Grade type pointer 'p', (ii) to assign values to three member variables of 'ME171[11]' using the pointer 'p'.

(c) Write a C function which returns a char-type pointer. Inside the function, there should be five country names as strings (character arrays). Upon calling, the function should randomly select a country name from among the five and return a char-type pointer (to country name) to the calling point. The caller function 'main' should store the randomly returned country name into another local string (character array). It then counts the length of the local string and prints the string (country name) and its length. (17)

4. (a) An two-dimensional integer array 'a' is declared as follows: (12)

```
int a[ ][3] = {3, 7, 5, 9, 4, 6};
```

Starting from an arbitrary memory address for the first array element, illustrate the memory addresses of the subsequent elements of the array with their correct indices and stored values in memory bytes.

(b) Illustrate the differences in computing environment with respect to the composition and execution of a program written in "Structured Programming" and "Object Oriented Programming (OOP)". (8)

(c) Write a class in C++ called 'Citizen' which will have two public variables: one character type array named 'name[20]' and another integer type 'age'. The class will also have a public method called 'charter' which receives the name and age of the 'Citizen' type objects and then based on their age, will rank them as a child (0 – 17 years), an adult (18 – 65 years) or a senior citizen (65+ years) and print the name and the rank of the objects. Create an object of 'Citizen' type in function 'main', initialize the object with a name and age. Finally print the name and rank of the object. [For example, if the name is "Sam" and the age is 70 then the output should be "Sam is a senior citizen."] (15)

**SECTION – B**

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

5. (a) What is a Programming Language? Write down the characteristics of Machine Language, Assembly Language and High-Level Language. (7)

(b) What do you mean by General Purpose Language and Special Purpose Language? Give two examples of each. (4)

(c) Write down the structure of a typical C program and explain. (6)

(d) Define Keywords and Identifiers in C Language. Write down the naming rules of Identifiers in C language with examples. (13)

(e) How is a letter, typed from a keyboard, stored in computer memory? (5)

**ME 171**

6. (a) Distinguish among getch(), getche(), getchar(), and gets() functions in C language. (4)

(b) Which of the following statements will show error message and why? (5)

- (i) int i; scanf("%d",&i);
- (ii) int i; scanf("%d",i);
- (iii) int i=61; printf("%d",&i);
- (iv) int i=61; printf("%d",i);
- (v) char str[100]; scanf("%s",str);

(c) Write the output of the following statements. (4)

- (i) printf("%07d",7);
- (ii) printf("%07d",-7);
- (iii) printf("%.3f', 3.1416);
- (iv) printf("%d", 5%6);

(d) Write and explain the output of the following C program. (6)

```
#include<stdio.h>
int main()
{
    int a = 65,b,c;
    b = a++;
    c = ++a;
    printf("%d \t %d", b, c);
    return 0;
}
```

(e) What are operators, operands and expressions? Briefly explain Cast Operator and Logical Negation Operator with examples. Write and explain the output of the following statements. (16)

- (i) printf("%d", -(-4-1) == 5 || !(3==3) && -1 > 0-1);
- (ii) printf("%d", 5&&6);
- (iii) printf("%d", 5&6);

7. (a) Explain when a *do-while* loop should be used instead of a *while loop*. Give one practical example of *do-while* loop and its corresponding code in C language. (8)

(b) Write a C program to identify whether a particular point in Cartesian coordinate system is inside or outside of a circle centered at (1, 1). The coordinates of the particular point and radius of the circle should be given as input by the user. (15)

(c) Write a C program that will store "Computer Programming Language" in a file named "ME\_171.txt". The program will then read the string from the file and show the output on the display. (8)

**ME 171**

**Contd ... Q. No. 7**

- (d) What do you mean by Algorithms? What are the factors that will define the best algorithm of a particular problem? (4)
8. (a) Write some advantages of Python programming language. "Python Interactive Prompt can be used for testing or experiment purposes." – explain. (10)
- (b) Classify variables in Python language. How can two strings be compared in Python language? (5)
- (c) Explain with examples: (8)
- (i) Immutability of string in Python language
  - (ii) Uses of indentation in Python language
- (d) Write a script in Python language that will take a one-dimensional array of 5 elements as input, add the elements of the array, check whether any element is 0 or not and replace 0 by 1 if found. The program will then add the elements of the modified array and print the number of zero's in the first array. (12)
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BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **HUM 101** (English)

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** including **Question No. 1** as compulsory.

1. Read the passage carefully and answer the questions that follow:

(45)

You seemed at first to take no notice of your school-fellows, or rather to set yourself against them because they were strangers to you. They knew as little of you as you did of them; so that this would have been the reason for their keeping aloof from you as well, which you would have felt as a hardship. Learn never to conceive a prejudice against other because you know nothing of them. It is bad reasoning, and makes enemies of half the world. Do not think ill of them till they behave ill to you; and then strive to avoid the faults which you see in them. This will disarm their hostility sooner than pique or resentment or complaint. I thought you were disposed to criticize the dress of some of the boys as not so good as your own. Never despise anyone for anything- that he cannot help – least of all, for his poverty. I would wish you to keep up appearances of yourself as a defence against the idle sneers of the world, but I would not wish you value yourself upon them. I hope you will never be the dupe nor victim of vulgar prejudices. Instead of saying above “Never despise anyone for anything that he cannot help”, I might have said, “Never despise anyone at all”. For contempt implies a triumph over and pleasure in the ill of another. It means that you are glad and congratulate yourself on their failings or misfortunes.

You might have hitherto been a spoilt child, and have been used to have your own way a good deal, both in the house and among your playfellows, with whom you were too fond of being a leader; but you have good nature and good sense, and will get the better of this in time. You have now got among other boys who are your equals, or bigger and stronger than yourself and who have something else to attend to besides humouring your whims and fancies, and you feel this as a repulse or a piece of injustice. But the first lesson to learn is that there are other people in the world besides yourself. The more airs of childish self-importance you give yourself, you will only expose yourself to be the more thwarted and laughed at True equality is the only true morality or wisdom. Remember always that you are but one among others and you can hardly mistake your place in society. In your own house you might do as you pleased; in the world you will find competitions at every turn. You are not learn to destroy or dictate to millions; you can only expect to share their fate, or settle your differences amicably with them.

**HUM 101(ME)**

**Contd ... Q. No. 1**

Questions:

- (a) What reasons does the author give for not harbouring a prejudice against others?
  - (b) What are some of the blessings of living with others in the same class on the same place?
  - (c) Comment on the statement, “contempt implies a triumph over and pleasure in the ill of another”.
  - (d) The author says that “in the world you will find competitions at every turn”. But competition is a very good thing. Why does he seem to warn us about?
  - (e) What message does the author try to convey to the readers?
  - (f) Write down the meaning of the following words as used in the passage:  
Conceive, prejudice, vulgar, contempt, repulse.
2. (a) What are the principles you need to follow while writing a business letter? **(10)**
- (b) Write a letter to a firm complaining against the supply of damaged and defective goods. **(10)**
- (c) Write phonetic transcriptions of the following words: (Any five) **(10)**  
Cottage, angel, basic, pleasure, leave, think.
3. (a) Discuss in brief the components of ‘Front Matter’ of a formal report. **(10)**
- (b) Write a short essay on any one of the following topics: **(10)**
- (i) Alarming World Climate
  - (ii) Online Education
  - (iii) Dhaka : My Dream City.
- (c) Write a dialogue between two friends about their planning for upcoming winter vacation. **(10)**
4. (a) Transform the following sentences as directed. (Any five) **(10)**
- (i) We all are born with a divine fire in us. (Complex)
  - (ii) I called her, but she did not answer. (Simple)
  - (iii) He speaks too fast to be understood. (Complex)
  - (iv) Nobody loves me as much as my mother. (Simple)
  - (v) Being a cripple, he cannot ride a horse. (Compound)
  - (vi) Do not get into a bus while it is moving. (Simple)
- (b) What are the salient features of a sales letter? **(5)**

**HUM 101(ME)**

**Contd ... Q. No. 4**

(c) Write short notes on any Three of the following:

**(15)**

- (i) Tender and its aspects
- (ii) Diphthongs
- (iii) Annual Confidential Report
- (iv) Parts of a paragraph.

**SECTION – B**

There are **FOUR** questions in this section. Answer any **THREE** including **Q. No. 5** as compulsory.

5. (a) Explain with reference to the context any **TWO** of the following:

**(15)**

- (i) "His forehead was resplendent with sacred ash and vermillion, and his eyes sparkled with a sharp abnormal gleam which was really an outcome of a continual searching look for customers, but which is simple clients took to be a prophetic light and felt comforted."
- (ii) "We've got to have rules and obey them. After all, we're not savages. We're English, and the English are best at everything."
- (iii) "This is our island. It's a good island. Until the grownups come to fetch us we'll have fun."

(b) Answer any **ONE** of the following:

**(15)**

- (i) By drawing a parallel between the elephant and the British Empire, Orwell successfully establishes the true nature of Imperialism. Elucidate.
- (ii) How does "The Rocking Horse Winner" explore the tension between what we 'think' and what we 'feel'? Discuss.

(c) Answer any **THREE** of the following:

**(15)**

- (i) What does the rocking horse represent in "The Rocking Horse Winner"?
- (ii) Nothing happens by accident and all human actions have consequences. Justify this statement in the light of R. K. Narayan's "An Astrologer's Day".
- (iii) Examine the portrayal of the character named Jack as antagonist in "Fire on the Mountain".
- (iv) What is Orwell's attitude toward the native people in "Shooting an Elephant"?

6. Recast and correct any **TEN** of the following:

**(15)**

- (i) Are you satisfied from your marks?
- (ii) I had finished the book yesterday.
- (iii) They are searching the ball.
- (iv) He learned us how to play hockey.
- (v) The earth goes round of the sun.



**HUM 101(ME)**

**Contd ... Q. No. 6**

- (vi) I saw a strange dream last night.
- (vii) They asked him to be captain but he refuses.
- (viii) Since he came, we have been happy.
- (ix) It is no good to get angry at once.
- (x) I was born the third of December.
- (xi) They have no houses to live.
- (xii) I have not seen him today morning.

(b) Give the meaning of and make a sentence with any TEN of the following: **(15)**  
Albino, Deride, Inquisitive, Homage, Retort, Vehemence, Yelp, Demolish, Testify, Pilfer, Repel, Opportunist.

7. Amplify the idea in any ONE of the following: **(30)**  
(a) When the going gets tough, the tough gets going.  
(b) Necessity is the mother of invention.

8. Write a précis of the following: **(30)**  
We live in an age of great hurry and great speed. Men have lost their inward resources. They merely reflect, life a set of mirrors, opinions which they get from outside. When they get a little leisure, they turn to material diversions from outside rather than to inward resources. In other words, this internal vacuum is responsible for mental and nervous troubles. The cure for this is not so much treatment by medicine and surgery but a recovery of faith in the ultimate goodness, truth and the decency of things. If we are able to recover that faith, if we are able to live in this world with our consciousness centered in the ultimacy of the spirit, many of the problems to which we are subject today may be overcome. Our people were regarded as aspiring after metaphysical insight and religious bliss, but we seem to forget that it never occurred to them to equate eternal life with either the surrender of the mind or the sacrifice of the body. When the Upanishad writer was asked to define what is meant by spiritual life or life eternal, he gave the answer that it consists of the play of the vital organism, the satisfaction of the mind, the abundance of tranquility of the spirit. Body, mind and spirit must be integrated and they must lead to a harmonious developed life. If we get that, we have life eternal.

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## BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2015-2016

Sub : **HUM 103** (Economics)

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 indicate their usual meaning.

1. (a) Define demand function. (5)
- (b) What are the factors that influence the shifting of the demand curve? (10)
- (c) How would you derive the market demand curve of a commodity? Explain graphically. (10)
- (d) What are the exceptions to the law of demand? (10)
2. (a) Define Income elasticity of demand and price elasticity of demand. (10)
- (b) Show that price elasticity of demand varies from zero to infinity along any straight line demand curve. Explain graphically. (15)
- (c) From the following table calculate elasticity of demand if you move from point B to C and explain what you understand from the result. (10)

Point	$P_x$	$Q_y$
A	500	120
B	600	150
C	700	180

3. (a) What is an indifference curve? Explain the properties of an indifference curve. (15)
- (b) Explain consumer's equilibrium with the help of budget line and indifference curve. (10)
- (c) From the following budget line and the utility function, calculate the amount of two commodities that maximizes satisfaction. What is the maximum amount of satisfaction? (10)

$$4000 = 25X + 35Y$$

$$U = 400 X^{0.6} Y^{0.7}$$

4. (a) How is price determined in an economy under competition? What will happen to the price and quantity due to simultaneous change in demand and supply? (15)
- (b) From the following demand and supply functions, calculate equilibrium price and quantity and show the results in a graph. (20)

$$P = 0.50 Q + 150$$

$$P = -0.40 Q + 300$$

- (i) What will happen to the equilibrium price and quantity if government imposes a unit tax of Tk 2 per unit?
- (ii) What will happen if government gives a subsidy of Tk. 3 per unit?
- (iii) Describe the change in equilibrium. Show the equilibrium coordinates on the same graph.

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**SECTION – B**

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

5. (a) What do you understand by division of labor? Explain different types of division of labor. (10)
- (b) Explain the advantages of division of labor. (10)
- (c) What do you understand by internal economics of scale of production? Explain different types of internal economics of scale of production. (15)
6. (a) What are the assumptions of a perfectly competitive market? Explain them. (10)
- (b) Explain the short run equilibrium of a firm under perfect competition. (15)
- (c) How would you derive the short run supply curve of a firm under perfect competition? Explain graphically? (10)
7. (a) According to Amartya Sen, 'the process of economic development can be seen as a process of expanding capabilities of people'. Briefly discuss Amartya Sen's view on economic development preceded by evolution of development economics. (15)
- (b) Explain 'Rostow's linear stage growth model' with examples and limitations. (10)
- (c) Critically explain Harrod-Domar growth model. (10)
8. (a) Development process in the surplus-labor nations can largely be explained by Lewis two-sector model. What does this model of economic development emphasis on? Critically examine the model. (15)
- (b) Consider a Solow economy with the production function:
- $$Y = A^\beta K^\alpha L^\beta, \alpha < 1, \beta > 0$$
- which is characterized by constant returns to scale. Here Y, K, L A and AL stand for output, capital, labor, technology and effective labor respectively. Moreover consider that technology and labor grow at constant rate 'g' and 'n' respectively.
- (i) Express the production function in per effective labor term. (3)
- (ii) Show that there is diminishing marginal returns to the capital per effective labor. (4)
- (iii) Find out the Solow equation  $\dot{k} = sy - (n+g+\delta)k$  of dynamics of economy and explain that graphically. (8)
- (c) Define LDC, developing and developed countries. (5)
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