

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2014-2015

Sub : **MATH 163** (Integral Calculus and Differential Equations)

Full Marks : 280

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

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

1. Compute the following:

$$(a) \int \frac{dx}{\sqrt[3]{\sin^{11} x \cos x}}, (b) \int \frac{3x-2}{1-6x-9x^2} dx (c) \int (x-3) \sqrt{\frac{2x^3-3x+1}{x-1}} dx \quad (15+15+16\frac{2}{3})$$

$$2. (a) \text{ Obtain a reduction formula for } \int x^n \cos mx dx \text{ and hence evaluate } \int x^3 \cos 3x dx. \quad (16)$$

(b) Evaluate:

$$\lim_{n \rightarrow \infty} \left[\left(2 + \frac{1}{n^2} \right)^{1/n^2} \left(2 + \frac{2^2}{n^2} \right)^{2/n^2} \left(2 + \frac{3^2}{n^2} \right)^{3/n^2} \dots \left(2 + \frac{n^2}{n^2} \right)^{n/n^2} \right] \quad (14)$$

(c) Employ Simpson's rule to calculate approximately the value of π from $\int_0^1 \frac{dx}{1+x^2}$ bydividing the interval $[0, 1]$ into 4 equal parts. (16 $\frac{2}{3}$)

$$3. (a) \text{ Evaluate : } \int_0^1 \frac{dx}{(1+x)(2+x)\sqrt{x(1-x)}}. \quad (16)$$

$$(b) \text{ Evaluate : } \int_0^{\infty} x^4 e^{-x^2} dx. \quad (14)$$

(c) Find the area interior to $y^2 = 2ax - x^2$ and exterior to $y^2 = ax$ lying in the first quadrant. Hence find the corresponding total area. (16 $\frac{2}{3}$)

$$4. (a) \text{ Find the intrinsic equation of } y^2 = 4ax, \text{ where } S \text{ is measured from the vertex.} \quad (14\frac{2}{3})$$

$$(b) \text{ Determine the perimeter of the loop of the curve } 3ay^2 = x(x-a)^2 \quad (15)$$

$$(c) \text{ Find the volume and surface area of the solid of revolution of the lemniscate } r^2 = a^2 \cos 2\theta \text{ about the initial line.} \quad (17)$$

MATH 163 (ME)**SECTION – B**

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

5. (a) Find the differential equation by eliminating arbitrary constants a and b from the equation $y = ae^{3x} + be^{-2x}$. (12)
- (b) Solve the following:
- (i) $(4x - y + 7)dx - (2x + y - 1)dy = 0$ (18 $\frac{2}{3}$)
- (ii) $dy + (y \cos x - y^n \sin 2x)dx = 0$ (16)
6. (a) Solve $x^2 \left(\frac{dy}{dx}\right)^2 + xy \frac{dy}{dx} - 6y^2 = 0$ (15)
- (b) Solve: $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ (16 $\frac{2}{3}$)
- (c) A car with its passengers weighs 1000 lbs. It is coming down an inclined road of inclination $5^\circ 45'$. Frictional force is 40.2 lbs. wt. and wind resistance in feet/sec. is twice the velocity of the car. What will be its velocity from rest after t seconds and after 10 seconds? What will be its final velocity? (15)
7. Solve the following higher order differential equations:
- (a) $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 13y = e^{3x} \sin 2x$ (15)
- (b) $\frac{d^3y}{dx^3} - 7\frac{dy}{dx} - 6y = x^3$ (16 $\frac{2}{3}$)
- (c) $x^3 \frac{d^3y}{dx^3} + 3x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = x \ln x$. (15)
8. (a) Solve the following differential equation by the method of factorization of operator $(x+3)\frac{d^2y}{dx^2} - (2x+7)\frac{dy}{dx} + 2y = (x+3)^2 e^x$. (15)
- (b) Solve: $y \frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = \frac{dy}{dx}$. (15)
- (c) Test for convergence or divergence of the following series: (16 $\frac{2}{3}$)
- $$x^2 + \frac{2^2}{3.4} x^4 + \frac{2^2.4^2}{3.4.5.6} x^6 + \frac{2^2.4^2.6^2}{3.4.5.6.7.8} x^8 + \dots$$
-

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2014-2015

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 – AThere are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) What do you understand by ‘Learning a computer programming language’? (4)
- (b) Give some examples of ‘computing platform’. Explain why the concept of computing platform is essential for a programmer. (12)
- (c) What are APIs? Explain how they are useful to a programmer. (7)
- (d) What are the different software components that are required to build-up a complete programming environment? – Discuss. (10)
- (e) Give an example of an IDE. (2)
2. (a) What are identifiers in a programming language? Write down the rules for naming identifiers in C. (9)
- (b) Write appropriate declaration/initialization statement(s) in C for each of the following: (10)
- (i) an integer variable that is assigned a value of 30,000
- (ii) a float variable having a value of 4.3 dereferenced by a pointer
- (iii) a character variable with the value “Mechanical”
- (c) Rewrite the following statement using if-else construct: (6)
- `x! = 0? Y = 1/x : printf (“undefined”);`
- (d) Use switch statement to implement the following block of statements: (10)
- ```

n = rand () % 10 ;
if (n == 0) exits (0);
else if (n == 1) y = 10;
else if (n == 2) y = 9 ;
else y = 8 ;

```
3. (a) Write a C program to generate 10 random integer numbers between 50 to 100 and sort them in descending order. (15)
- (b) Write a C program that will generate a table of values for x from the following equation: (20)

$$y = 1 - \frac{1}{x^{k-1}} \text{ where } k = 1.4$$

Take x = 8 to 22

increment x by 1 at each step.

**ME 171**

4. (a) Explain the significance of the four pillars of Object Oriented Programming (OOP). (8)

(b) Rewrite the following codes of C for console I/O using C++ constructs for File I/O:

```
include <Stdio.h>
int main ()
{
 char name [20];
 scanf ("%S", name);
 printf ("%S", name);
 return 0;
}
```

(c) Write a C++ program in OOP style which will contain a class "Student". The "Student" class will have four public member variables : "id, name, gpa[5] and credits" with appropriate variable types. The "Student" class will have two methods, one for calculating the total credits completed, another for calculating gpa. Instantiate an object of "Student" class in the main ( ) function named 'student1'. Enter the individual credits [for 5 subjects] and grade-points for the 'student1' object and display the credits completed and gpa obtained by 'student1'. (17)

**SECTION – B**

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

5. (a) What do you understand by "Call-by-value" and "Call-by-reference"? Give examples. (7)

(b) Write a program using recursion to reverse a sentence typed in from the keyboard. (18)

(c) Write a program to change a string to lower case without using the built-in strlwr ( ) function. (10)

6. (a) Write a program to evaluate the sine series up to 10<sup>th</sup> term. (10)

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots 10^{\text{th}} \text{ term}$$

Use separate functions to evaluate factorial and power.

(b) Write a program to find the frequency of all characters in a string. (10)

(c) Write a program using structure to store the information (name, roll number and 3 class test marks) of 50 students in a class. (10)

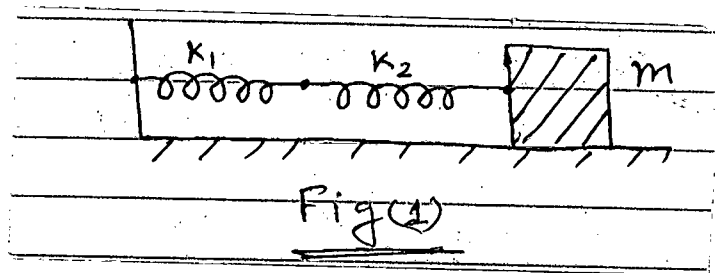
(d) What is function prototype? Is it always necessary? (5)

**ME 171**

7. (a) What are the differences between structures and unions? (5)
- (b) Write a program using pointer to calculate the sum of all the elements of an array containing 10 integers. Your program should take the input of the numbers in the main ( ) function and calculate the sum in a separate function using pointer arithmetic. (12)
- (c) Write a program using structure to add two complex numbers (add real part with real part and imaginary part with imaginary part) and print the result. Your program should take the input in the main ( ) function and add them in a separate function. (12)
- (d) (i) Show how the members of a structure type variable can be accessed using pointers. Give example.
- (ii) Show how the elements of an array can be accessed using pointer variable. Show example.
8. (a) What are the advantages of file directed input-output over console based input-output? (5)
- (b) Write a program to find the length of a string saved in a text file. (8)
- (c) A text file named list.txt in the C drive of a computer contains a list of 10 floating point numbers. Write a program to read the numbers from the text file, sort them and finally print the sorted list in a separate file in the same drive. (15)
- (d) Write a program to check whether the entered string is a palindrome or not. [Palindrome: a word, phrase or sequence that reads the same backwards and forwards, e.g. eye, noon, madam.] (7)
-

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

1. (a) What are Lissajous figures? On what factors does it depend? (5)
- (b) Derive a general expression for the resultant vibration of a particle simultaneously acted upon by two initially perpendicular simple harmonic vibrations having same period but different phase and amplitude. What happens if the two vibrations are in (i) the same phase and (ii) opposite phase with their amplitudes being equal? (22)
- (c) Two springs are joined and connected to a mass of 'm' as shown in Fig. 1. The surface is frictionless. If the springs separately have force constants  $k_1$  and  $k_2$ , show that frequency of oscillation of 'm' is  $f = \frac{1}{2\pi} \sqrt{\frac{k_1 k_2}{(k_1 + k_2)m}}$  (8)



2. (a) Explain the term wave motion and discuss about the different types of waves. (5)
- (b) Obtain expressions for energy density and intensity of a plane progressive wave. (22)
- (c) A source of sound has a frequency of 700 Hz and amplitude of 0.25 cm. What is the flow of energy across a square cm per second, if the velocity of sound in air is 332 m/s and density of air is  $0.000129 \text{ g/cm}^3$ ? (8)
3. (a) What are the reverberation and reverberation time? On what factors does it depend? (5)
- (b) Show that in the case of a stationary wave, no energy is transferred across any section of the medium. (22)
- (c) A wave is given by  $y_1 = A \sin(\omega t - kx)$  is sent down in a string. Upon reflection it becomes  $y = \frac{A}{2} \sin(\omega t + kx)$ . Show that the resultant of these two waves on the string can be written as a combination of a stationary wave and a progressive wave. (8)

## PHY 159

4. (a) Draw the ray diagrams of the followings for convex or concave lenses. (10)
- (i) Principal points
  - (ii) Principal foci
- (b) What is dispersive power of a lens? Explain it is a positive quantity. Find the expression for the chromatic aberration in a lens. (15)
- (c) The focal lengths of the convex lens and the concave lens are 8 cm and 4 cm, respectively. The lenses are placed at a certain distance apart. Calculate the distance between the lenses if they form achromatic combination. (10)

### SECTION – B

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

5. (a) Two thin Convex Lenses of power  $P_1$  and  $P_2$  are placed co-axially in air at a certain distance  $d$  apart. Show that their equivalent power  $P$  is given by  $P = P_1 + P_2 - d P_1 P_2$  (20)
- (b) Deduce the following expression by using the Newton's formula for a convergent system of lens forming a real image (15)

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

where the symbols have their usual meanings.

6. (a) Define spherical aberration of a lens. What are the methods of minimizing spherical aberration in a lens? (7)
- (b) Deduce an expression for the shape of the lens for minimum spherical aberration from the following equation

$$x = \frac{h^2}{f} \left[ \frac{k^2 \mu^3 + k(\mu + 2\mu^2 - 2\mu^3) + \mu^3 - 2\mu^2 + 2}{2\mu(\mu - 1)^2(1 - k)^2} \right] \quad (18)$$

where the symbols have their usual meaning.

- (c) Calculate the shape and shape factor of a lens to exhibit minimum spherical aberration when the lens material has a refractive index 1.5. (10)
7. (a) Write down the required characteristics of wave function  $\psi$ . (5)
- (b) Explain the energy eigen function for an electron that is strongly bound to its atomic nucleus. Draw schematically the allowed energy levels for different  $n$ -values. (20)
- (c) Draw schematically the wave function  $\psi$  and the probability function  $\psi \times \psi$  for an electron which is bound in a potential Well. What conclusions can be drawn from these schematic diagrams? (10)

**PHY 159**

8. (a) Explain 'Quantum Mechanical Tunneling' effect and write down its important applications in solid state physics. (15)
- (b) Distinguish between Bose-Einstein and Fermi-Dirac distribution functions. What are Fermions and Bosons? (10)
- (c) Show schematically a comparison of the three statistical distribution functions considering that the functions give the probability of occupancy of a state of energy  $\epsilon$  at the absolute temperature  $T$ . (10)
-



---

**SECTION – A**

There are **FOUR** questions in this Section. Answer any **THREE** including Q. No. 1 as compulsory.

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

(45)

A world without poverty. Whenever I mention this to people who have not experienced the power of micro-credit first-hand, I see a half smile after masking their obvious cynicism or doubt. Even supporters of micro-credit sometimes view this as an 'impossible dream'. Which we use to motivate ourselves and our workers. To me, a world without poverty means that every person would have the ability to take care of his or her own basic life needs. In such a world nobody would die of hunger or suffer from malnutrition. This is a goal world leaders have been calling for decades, but have never set out any way of achieving it.

Today 40,000 children die each day around the world from hunger related diseases. In a poverty-free world, no children would die of such cause. Everybody in every part of the globe would have access to education and health-care services because he or she would be able to afford them. Unlike today, the state would not be required to free subsidized health-care or schooling.

Social structures in a poverty-free world would, of course, be quite different from those that exist in a poverty-ridden world. But nobody would be at the mercy of anyone else, and that is what would make all the difference between a world without poverty and one riddled with it. One-fifth of the world's inhabitants who today live a life of extreme poverty would become income earners and income spenders. The world generates extra demand in the market to make the world economy grow. They would bring their creativity and innovations into the market place to increase the world's productive capacity.

But even in a poverty-free world there would always remain differences in life style between people at the bottom of society and those at the top income levels. Yet the difference would be the difference between the middle-class and the luxury class. Just as on trains in Europe today you have only first class and second-class carriages, whereas in the nineteenth century there were third-class and even fourth-class carriages. – sometimes with no windows and just hay strewn on the floor.

## HUM 101

### Contd ... Q. No. 1

Can we really create a poverty-free world? A world without third-class citizens, a world without a hungry, illiterate under-class? Yes we can, in the same way as we can create sovereign states, or 'democratic' political systems, or 'free' market economics. A poverty-free world would not be perfect, but it would be the best approximation of the ideal. We have created a slavery free world, a polio-free world, and apartheid free world. Creating poverty-free world would be greater than all these accomplishments while at the same time reinforcing them. This would be a world that we could all be proud to live in. (Source: Banker to the Poor by Mohammad Yunus).

Questions:

- (a) Why even the supporters of micro-credit, do you think, sometimes view its power as an 'impossible dream'?
  - (b) What do you think, in the writer's imagination are the changes that the micro-credit can put forward?
  - (c) 'A poverty-free world would not be perfect, but it would be the best approximation of the ideal'.
  - (d) Do you consider the power of micro-credit to be utopian or realistic? Give reasons in favour of your choice.
  - (e) Give a suitable title to the passage and justify it.
  - (f) Write down the meaning of the following words as used in the passage:  
Cynicism, malnutrition, subsidized, apartheid, accomplishments
2. (a) Briefly discuss the principles of writing a business letter. (10)
- (b) Write a complaint letter to the Manager (sales) of Navana Automobiles Limited informing him about the motor parts which they have supplied were found defective. (10)
- (c) Write phonetic transcriptions of the following words: (Any five) (10)  
About, cottages, decade, hunger, think, care.
3. (a) What are the elements of structure of a formal report? (5)
- (b) Write a short essay on any one of the following topics: (15)
- (i) Modern Society and Traditional values
  - (ii) Depression: A Psychic enemy
  - (iv) Culture: Pride of Every Nation
- (c) Write a dialogue between two parents about their concern over the changing pattern of behaviour of young generation. (10)
4. (a) Transform the following sentences as directed. (Any five). (10)
- (i) Speak the truth and I shall pardon you. (Simple)
  - (ii) What he has said is true. (Simple)

## **HUM 101**

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

- (iii) Suspicion always haunts the mind of a person who is guilty. (Simple)
  - (iv) Being ill, he didn't attend the party. (Compound)
  - (v) Spare the rod and spoil the child. (Complex)
  - (vi) The news is too good to be true. (Complex).
- (b) What are the characteristic features of a sales letter? (5)
- (c) Write short notes on any three of the following: (15)
- (i) Diphthongs
  - (ii) Terminator in a paragraph
  - (iii) Annual Confidential Report
  - (iv) Avoidances in dialogue

### **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) On a certain occasion I read a little story that greatly took my fancy.
  - (ii) He had left his village without previous thought or plan.
  - (iii) Feelings like these are the normal by-products of imperialism.
- (b) Answer any one of the following: (15)
- (i) Discuss "An Astrologer's Day" as story of crime, remorse and redemption.
  - (ii) Examine Orwell's use of symbolism in "Shooting an Elephant". What do these symbols really represent?
- (c) Answer any three of the following: (15)
- (i) What made Orwell feel that he had to shoot the elephant?
  - (ii) What evidence does Ralph give the other boys to persuade them that they will be rescued?
  - (iii) Discuss the role of fate in the story "An Astrologer's Day."
  - (iv) How does R.K. Narayan describe the appearance and paraphernalia of the Astrologer?
  - (v) What is Maugham's assessment of Bertrand Russel?
6. (a) Recast and correct any ten of the following sentences: (15)
- (i) A trio of boys were scheduled to recite poems.
  - (ii) Tani will not do the work except I give the order.
  - (iii) I was angry at his comments.
  - (iv) Dina has more mistakes on her paper than him.

## HUM 101

### Contd ... Q. No. 6(a)

- (v) The letter came before the package.
- (vi) Our teacher told us that in France they eat pancakes with honey.
- (vii) We shall ship the merchandise as per your instructions.
- (viii) I shall accompany the winners, whoever they may be.
- (ix) Shathi is the one of the boys who are on time.
- (x) Her singing is vital to the success of the party.
- (xi) The memoranda is not important.
- (xii) The secretary gave a fulsome account of the minutes.

(b) Give the meaning of and make a sentence with any ten of the following words: (15)

Astray, Benchmark, Castigate, Drench, Flounder, Hubbub, Impromptu, Lustrous, Munch, Outrageous, Posterity, Ratify.

7. Amplify the idea in any one of the following: (30)

- (i) Speech is silver, silence is golden.
- (ii) A stumble may prevent a fall.

8. Write a précis of the following: (30)

Even in 1971 there were among the Bengali intellectuals some, though negligible in number, who clung to Pakistani nationalism. And there is no denying that most intellectuals of the Pre-1947 generation had been supportive of the demand for Pakistan. This had happened owing partly to the non-inclusiveness of the Hindu-dominated Indian National Congress and partly to hope that a separate homeland would augur the Bangali Muslims well. The turning point in the intellectual life of East Pakistan was the State Language Movement of 1952. That movement sought to replace the religion-based Pakistani nationalism by secular Bengali-nationalism. The upsurge was political; it was against the very foundation of the newly-established state itself and its ultimate objective was to establish people's control over state power. Whereas the Pakistan movement had aimed at, and was successful in, winning a homeland for the Muslims, the anti-state Language Movement wanted to transform that homeland into a habitat of a people released from fetters of a bureaucratic-capitalistic state, engaged as it was in protecting a class-divided society. The movement was more than an undertaking of resistance against an imposition. Its expectation was to go much further. In reality, the movement was driven by the unspoken agenda of establishing a system of socialist dispensation, capable of guaranteeing equality of rights and opportunity to all citizens, irrespective of religion and class. Pakistan was a semi-colonial state carved out of the colonial state of British India, and turned out to be no less exploitative than the one it replaced.

**HUM 101**

**Contd ... Q. No. 8**

The weak suffered in relation to the strong; the Bengalis were weak because state power was monopolistically wielded by the non-Bengali military bureaucracy with the assistance of an obliging civil bureaucracy. The martyred intellectuals of 1971 carried in them the secular democratic spirit of the State Language Movement, which spirit drew the people together. The spirit became stronger as it moved on and ultimately found itself released in the liberation war. These intellectuals were positively secular in outlook and secularism, one knows is essential for stepping into a democracy of rule by the people and not merely by the parliament.

---

**SECTION – A**

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

1. (a) Narrate the principal criteria that are considered for classifying market structures in economics. Why is perfect competitions so rare in the real world? (10)
- (b) Describe the loss minimizing and the shut down points of a firm under perfect competition. (15)
- (c) The following are respectively the average revenue (AR) and average cost (AC) functions of a firm (10)

$$AR = 1400 - 7.5Q$$

$$AC = Q^2 - 6Q + 140 + 750/Q$$

Find the maximum profit earning level of output and maximum profit.
2. (a) Clarify the concepts of short run and long run in the theory of production. (10)
- (b) Illustrate the conditions for optimum combination of factors of production. (15)
- (c) Describe the economies of scale of production relating to increasing returns to scale of production. (10)
3. (a) What do you understand by 'economic growth' and 'economic development'? (10)
- (b) "Development is both a physical reality and a state of mind". Explain this statement with the help of three core values of development. (15)
- (c) State five common obstacles to economic development in developing countries and discuss them with reference to the context of Bangladesh. (10)
4. (a) Illustrate the concepts of 'Lorenz Curve' and 'Gini coefficient'. (10)
- (b) What is the main purpose of a cost-benefit analysis (CBA)? How does the 'present value approach' differ from the 'internal rate of return approach'? Explain. (15)
- (c) Describe the procedure of a cost-benefit analysis (CBA). (10)

**HUM 103**

**SECTION – B**

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

5. (a) What do you understand by localization of industries? What are the main causes of localization of industries? Explain them in brief. (15)
- (b) Explain the advantages and disadvantages of localization of industries. (20)

6. (a) What are the determinants of price elasticity of demand? (10)
- (b) How would you measure price elasticity of demand at any point on a straight line demand curve? Explain graphically. (15)
- (c) From the following table calculate elasticity of demand if you move from point A to C and explain what you understand from the result. (10)

| POINT | P <sub>x</sub> | Q <sub>y</sub> |
|-------|----------------|----------------|
| A     | 1500           | 150            |
| B     | 1600           | 180            |
| C     | 1700           | 210            |

7. (a) What is unemployment and unemployment rate? Explain different types of unemployment that exists in a development country like Bangladesh. (15)
- (b) Graphically explain the equilibrium unemployment and disequilibrium unemployment. (10)
- (c) What are the causes of disequilibrium unemployment? Explain graphically. (10)

8. (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 result in a graph. (20)

$$P = 0.20 Q + 10$$

$$P = - 0.40 Q + 70$$

- (i) What will happen to the equilibrium price and quantity if government imposes a unit tax of Tk. 5 per unit?
- (ii) What will happen if government gives a subsidy of Tk. 10 per unit?
- (iii) Describe the change in equilibrium. Show the equilibrium coordinates on the same graph.
-

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2014-2015

Sub : **CHEM 141** (Chemistry of Engineering Materials)

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) What are the major troubles arise in the boiler due to use of impure water? Distinguish between scale and sludge. Write the chemical reactions involved in the formation of scale and sludge in the boiler. (4+3+3=10)
- (b) Why corrosion takes place in the boiler due to use of untreated water? Discuss how boiler corrosion can be removed by physico-chemical methods. (4+6=10)
- (c) What are the detrimental effects of friction between two sliding surfaces? How would you classify the lubricants based on the physical states? Discuss the properties of graphite as the solid lubricants. (5+5+5=15)
  
2. (a) How the rate of corrosion can be expressed by various units? Discuss the effects of  $p^H$  and dissolved salts on the rate of under water corrosion. (2+6+6=14)
- (b) How corrosion can be controlled by using sacrificial anode and impressed current? (12)
- (c) Write short notes on the following terms (9)
  - (i) Local action cell (ii) Hot-dip process (iii) Cathode sputtering
  
3. (a) How would you classify the pottery wares? Describe the important properties of the clay which have made it principal raw materials of ceramic articles. (6+6=12)
- (b) What are the functions of feldspar as a ceramic raw materials? Write the name and chemical formula of the different types of feldspar. Draw the flow diagram of the different steps of manufacturing ceramic white wares. (3+3+6=12)
- (c) Write the different chemical conversion involved during firing of ceramic wares. Mention the name and chemical formula of the principal refluxing agents and principal refractory agents which are used together with the basic raw materials of the ceramic products. (5+3+3=11)
  
4. (a) Define refractory materials? Discuss the characteristic properties of a good refractory. (8+3=11)
- (b) Describe the different steps of the industrial manufacturing process of refractory materials. (12)
- (c) Write short notes on the following (12)
  - (i) Softening temperature (ii) Porosity (iii) Spalling



**CHEM 141**

**SECTION – B**

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

5. (a) What is biodegradable plastics? Discuss the different types of polymerization reactions. (9)
- (b) What are the available forms of plastics? (8)
- (c) Describe physical and optical properties of plastics (6)
- (d) Describe the preparation of the following plastics with reactions (any two). Mention their uses. (12)
- (i) Melamine-formaldehyde resin (ii) Nitrocellulose (iii) Polyvinylchloride
6. (a) Give the classifications of synthetic fibres. (6)
- (b) Describe the manufacturing process of viscose rayon with flow sheet and reactions. (14)
- (c) Write short notes on the following (any three) (15)
- (i) Poly urethane (ii) Methods of spinning (iii) Poly carbonate, (iv) Dynel.
7. (a) What are the different types of Rubber? Give the structure of their monomers. (10)
- (b) What are the chemical compositions of Natural Rubber Latex? (6)
- (c) Discuss the industrial manufacturing process of styrene-butadiene Rubber (SBR). (12)
- (d) What is vulcanization? How do you perform Non-sulfer vulcanization? (7)
8. (a) Give the classification of glasses? (8)
- (b) What are the different types of raw materials of glass? (8)
- (c) Describe the manufacturing process of Graphite with flow sheet. (9)
- (d) Write short notes on the following (any two) (10)
- (i) Manufacturing process of glass.
- (ii) Activated carbon
- (iii) Carbon Black
-