BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2020-2021

Sub: **PLAN 111** (Human Settlements Development)

Full Marks: 210   Time: 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks

SECTION – A

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

1.   (a) 'Urban area' and 'Urbanization rate' are two different terminologies. Define them.   **(8)**

      (b) Why a developed country may not even be 100% urbanized?   **(7)**

      (c) In the population census reports of Bangladesh urban areas are categorized as 'declared urban area' and 'other urban areas'. Define them.   **(10)**

      (d) Differentiate between the following terms: **(5×2=10)**

          (i) mega city and primate city (ii) core area and fringe area

2.   (a) There are political, administrative and locational causes behind the growth of Dhaka city in this particular location. What are the location related reasons?   **(8)**

      (b) How different political events have affected the growth of Dhaka city over the time?   **(10)**

      (c) Why Dhaka has kept growing northward till its establishment?   **(7)**

      (d) What is Silk Route? Does it have any influence on the establishment and growth of cities in the medieval period?   **(5+5=10)**

3.   (a) Name the important urban centres in the area of current Bangladesh in ancient and medieval times. Does the location forecasting these centres have any relationship with hydrology and topography in those periods? Explain.   **(8+6=14)**

      (b) Why the buildings and structures of ancient and medieval cities are lost and destructed over time in Bangladesh?   **(7)**

      (c) Why do the human settlements in Bangladesh look like hills or stack of soil and buildings or structures look like square or rectangular in shape.   **(7)**

      (d) What do the utensils and coins found in the lost human settlements say about the civilization?   **(7)**

4.   (a) Write short notes on the special features of Harappa and Monenjo-Daro civilization.   **(17)**

PLAN 111
Contd... Q. No. 4

(b) Do you think that the anticipated reason for the destruction of Harappa and Mohenjo-Daro has any implication for the modern cities? Justify your answer. **(9)**

(c) "Old and medieval cities in Indian Sub-continent were not situated evenly all over India." Do you agree with this statement? Justify your answer. **(9)**

SECTION – B

There are **SEVEN** questions in this section. Answer any **FIVE**.

5. (a) Human settlement started to organize in around 4,000 BC. Since then different factors have time to time contributed to the gradual formation of dynamic urban settlements. What are those factors? Explain the contribution of these factors in through formation of urban settlement with necessary diagrams. **(15)**

(b) Write a short note on the 'houses in Egyptian city'. **(6)**

6. How the rivers, Euphrates and Tigris, shaped the ancient Sumerian city – states? Explain briefly. **(21)**

7. During renaissance, the city was conceived as an 'object of art'. Do you think it is logical to consider a city as an 'object of art'? Justify your answer. **(21)**

8. Compare the urban life in classical cities with that of medieval towns in the context of political culture exercised during these two periods. **(21)**

9. During the golden age of Islam, the Abbasid Caliph Al-Mansur strategically decided the location and form of the city Baghdad. Do you agree with the statement? Justify with necessary illustrations. **(21)**

10. "In the face of industrial revolution, English parliamentary stenographer showed how workable and livable towns could be formed within the capitalist framework". Briefly explain the statement. Use illustrations if applicable. **(21)**

11. Write short notes on the following – **(3×7 = 21)**
    (a) Sir Patrick Geddes,
    (b) The new community movement,
    (c) Broadacre city.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   BURP Examinations 2020-2021

Sub: **MATH 101** (Mathematics I)

Full Marks: 140   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** questions.

1.   (a) Consider the function $f(x) = \begin{cases} x^2, & x < 0 \\ x, & 0 \le x \le 1 \\ \frac{1}{x}, & x > 1 \end{cases}$ **(12)**

     (i) Draw the curves, (ii) Find the domain, (iii) Find the range using graph, and (iv) Is $f(x)$ continuous on its domain?

     (b) Answer the following questions for the function $f(x) = 4x^2 - x - 5$ **(11⅓)**

         (i)   If $x = -4$, what is $f(x)$? What point is on the graph of f?

         (ii)   If $f(x) = 9$, what is x? What point is on the graph of f?

         (iii)   What is the domain of f?

         (iv)   List the x-intercepts, if any, of the graph of f?

         (v)   List the y-intercepts, if any, of the graph of f?

2.   (a) Consider the polynomial function, $f(x) = 5x^3 + 2x^2 - 16x + 36$.   **(11⅓)**

         (i)   Determine the maximum number of real zeros that the function may have.

         (ii)   Find the x-intercept and y-intercept of the function of f.

         (iii)   Determine whether the graph crosses or touches the x-axis at each x-intercept.

         (iv)   Determine the behaviors of the graph of f near each x-intercept.

     (b) Solve graphically the following system of equations.   **(6)**

$$2x - y + 1 = 0$$
$$x - 2y + 8 = 0$$

     (c) Solve the following inequality and graph the solution set   **(6)**

$$4x^2 < 3x + 12$$

3.   (a) Find the horizontal or oblique asymptote, (if exists)   **(8)**

         (i) $f(x) = \dfrac{7x^3 - 3x + 4}{2x^3 - x}$ (ii) $f(x) = \dfrac{x^3 + 8x - 24}{x^2}$.

MATH 101/URP

Contd... Q. No. 3

(b) Determine whether the function $f(x) = \dfrac{3x+5}{2x-4}$, $x \neq 2$ is one-to-one or not. Find

the inverse of the function. (8⅓)

(c) Consider $f(x) = \dfrac{5x}{x-4}$ and $g(x) = \dfrac{7-x}{x+9}$. Find the domain of $f \circ g$ and $g \circ f$. (7)

4. (a) Solve the equation (8⅓)

$$2\cosh 2x + 10\sinh 2x = 5$$

(b) Solve: $\ln 2x + \ln x^2 - \ln \sqrt[3]{x} = 1 + \ln 2 - \ln x^{-3}$. (8)

(c) How many years will it take a bacteria population to reach 9000, if its growth is

modelled by $f(t) = \dfrac{10000}{1 + e^{-0.12(t-20)}}$, here t in years? (7)

SECTION – B

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

5. (a) Give definition with appropriate examples of transpose of matrix, conjugate of

matrix, inverse of matrix, symmetric matrix, skew-symmetric matrix. (10)

(b) Let A be the square matrix (6)

$$A = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 2 & 3 \\ 1 & -1 & 0 \end{bmatrix}$$

Compute A^3 and $A^2 - 2A + I$, where I is the identity matrix of order 3.

(c) Let (7⅓)

$$A = \begin{bmatrix} 2 & -1 & 3 \\ 0 & 4 & 5 \\ -2 & 1 & 4 \end{bmatrix}, \quad B = \begin{bmatrix} 8 & -3 & -5 \\ 0 & 1 & 2 \\ 4 & -7 & 6 \end{bmatrix}$$

verify that $(AB)^T = B^T A^T$.

6. (a) If A and B are invertible matrices of the same size, then prove that AB is invertible

and $(AB)^{-1} = B^{-1} A^{-1}$. (12)

Given $A = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -3 \\ 4 & 4 \end{bmatrix}$

MATH 101/URP
Contd... Q. No. 6

    (b) Determine the inverse of the matrix given below by elementary row transformations.   **(11⅓)**

$$A = \begin{bmatrix} 3 & 3 & 1 \\ 1 & 2 & 1 \\ 2 & -1 & 1 \end{bmatrix}.$$

7.   (a) Find row operations that will restore the given elementary matrix to an identity matrix.   **(11⅓)**

$$\begin{bmatrix} 1 & 0 & 5 \\ 10 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

    (b) Define rank of a matrix.   **(12)**

Let $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 3 & 2 & 1 & 0 \end{bmatrix}$

Compute the rank of A^{T}.

8.   (a) Consider the system of equations   **(11⅓)**

$$\begin{aligned} x + y + 2z &= a \\ x \qquad + z &= b \\ 2x + y + 3z &= c \end{aligned}$$

Show that for this system to be consistent, the constants a, b and c must satisfy $c = a + b$.

    (b) Solve the following system of equations   **(12)**

$$\begin{aligned} x + y + z &= 9 \\ 3x + 2y - z &= 8 . \\ 3x + y + 2z &= 1 \end{aligned}$$

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-I/T-I B. URP Examinations 2020-2021

Sub : **CHEM 123** (Basic Environmental Chemistry)

Full Marks : 210   Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

Assume reasonable values for missing data, if any. Symbols carry their usual meanings.

SECTION – A

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

1. (a) How does Bohr atomic model violate the uncertainty principle? Draw the radial probability distributions of electrons for the 1s, 2s,and 3s orbitals of hydrogen. **(15)**

    (b) Write short notes on- **(10)**

    (i) Hund's rule (ii) Pauli's exclusion principle

    (c) Calculate the longest wavelength (in nm) of Balmer series of hydrogen atom. Given $R_H = 1.097 \times 10^7 \, m^{-1}$. **(10)**

2. (a) Distinguish between electron affinity and electronegativity. How can you explain the lower ionization energy of oxygen compared to that of nitrogen? **(15)**

    (b) How does the electron configuration of chromium and copper contradict the Aufbau principle? **(10)**

    (c) What is meant by radioactive decay? Discuss different types of particulate and electromagnetic radiations. **(10)**

3. (a) How molecular orbital theory (MOT) can be used to predict the bond order and magnetic properties of N_2 molecule? **(10)**

    (b) Draw the structure of the following molecules with the help of VSEPR theory and predict their molecular geometry and hybridization – **(10)**

    (i) SF_4 (ii) IF_3 (iii) SO_2 (iv) PCl_5

    (c) Explain the following statements – **(15)**

    (i) Boiling point of H_2O is higher than H_2S (ii) BeF_2 is linear while SF_2 is not

4. (a) Define acids and bases with example according to Lewis concept. Explain the concept of conjugate acids and bases. **(10)**

    (b) Discuss the reason and environmental impact of – (i) Acid rain (ii) Ocean acidification **(15)**

    (c) What is the basic difference between in-situ methods and laboratory methods of pollution detection? The density of a 2.45 M aqueous solution of methanol is 0.976 g/mL. Calculate the molality of the solution. **(10)**

CHEM 123

SECTION – B

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

5. (a) What is ecosystem? Describe the fundamental constituents of an ecosystem. **(2+13)**

   (b) Explain the characteristics features of major environmental segments of the earth. **(20)**

6. (a) How the radiation balance is maintained on earth? **(10)**

   (b) How does NO_x lead to the depletion of ozone in the stratosphere region? **(10)**

   (c) Define pollution. Illustrate various major pollutants responsible for air pollution in our environment. **(1+14)**

7. (a) What are the criteria for USPH drinking water? **(5)**

   (b) Describe various treatment methods depending on the characteristics of the particular waste water. **(20)**

   (c) What does dissolved oxygen (DO) mean? How can we measure DO of water in the laboratory? **(2+8)**

8. (a) What are the basic differences between organic and chemical fertilizers? How do the fertilizers pollute our green environment? **(5+5)**

   (b) What is POPs and Dirty Dozen? Write with examples. **(5)**

   (c) Explain biomagnifications of POPs with an appropriate example. **(10)**

   (d) Detergent is used as an essential cleaning agent in our daily life. How detergents can be classified into different categories? Briefly describe the adverse effect of using detergent in our environment. **(4+6)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   BURP Examinations 2020-2021

Sub: **HUM 125** (English)

Full Marks: 140   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** questions including Q. No. 1 as compulsory.

1.   Read the following passage carefully and answer all the questions that follow: **(30)**

In our society there is a growing dislike of original, creative men. The manipulated do not understand them; the manipulators rear them. The tidy committee men regard them with horror, knowing that no pigeonholes can be found for them. We could do with a few original, creative men in our political life ----- if only to create some enthusiasm, release some energy-----but where are they? We are asked to choose between various shades of the negative. The engine is falling to pieces while the joint owners of the car argue whether the footbrake or the handbrake should be applied. Notice how the cold, colourless men, without ideas and with no other passion but a craving for success, get on in this society, capturing one plum after another and taking the juice and taste out of them. Sometimes you might think the machines we worship make all the chief appointments, promoting the human beings who seem closest to them. Between midnight and dawn, when sleep will not come and all the old wounds begin to ache, I often have a nightmare vision of a future world in which there are billions of people all numbered and registered, with not a gleam of genius anywhere, not an original mind, a rich personality, on the whole packed globe. The twin ideals of our time organization and quantity, will have won forever.

Questions:

(a) Why is the writer so concerned about our new society?

(b) What do you understand by the metaphor, 'the engine is falling to pieces'?

(c) How is the nightmare vision of the future world as depicted by the writer?

(d) Explain in your own words the statement, 'the twin ideals of our time organization and quantity, will have won forever.'

(e) Give a title to the passage and justify it.

(f) Write down the meanings of the words as used in this passage:

manipulator, enthusiasm, ache, nightmare, gleam.

2.   (a) You have received some products in a damaged condition from your suppliers. Now write a letter of complaint emphasizing the need of greater care in complying with the order. (Provide necessary details from your own).   **(10)**

(b) Write phonetic transcription of the following words: (Any Five)   **(10)**

Match, judge, table, poor, son, thank.

3.   (a) Write a dialogue between two friends meeting in BUET Campus after Corona Pandemic.   **(10)**

(b) Write an essay on any ONE of the following: **(10)**

(i) Positive Thinking: A Key to Success in Life.

(ii) Juvenile Delinquency: A Social Curse

(iii) Virtual Life: A Threat to Human Ties

4.   (a) Transcribe the following sentences as directed: (Any Five)   **(10)**

(i) The war is over and silence prevails. (Simple)

(ii) We are all born with a divine fire in us. (Complex)

(iii) Speak the truth and I shall pardon you. (Simple)

(iv) Being a cripple, he cannot ride a horse. (Complex)

(v) A relationship needs to be tended like a plant. (Compound)

(vi) The evil that men do live after them. (Compound)

(b) Write short notes on any TWO of the following: **(10)**

(i) The Diphthongs

(ii) Components of a formal report

(iii) Different phases of Oral Presentation.

SECTION – B

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

5.   (a) Explain with reference to the context any one of the following: **(8)**

(i) "The geniuses of all ages and all lands speak different languages, but the same flame burns in them all.

(ii) "But we can't possibly have a garden-party with a man dead just outside the front gate".

(b) Answer any one of the following questions: **(10)**

(i) How do you evaluate the changes that occurred in the life of the lawyer in 'The Bet'?

(ii) Do you think that Mrs. Matilda Loisel suffered more than she deserved? Illustrate your answer with reference to the story of 'The Diamond Necklace.

(c) Answer any three of the following questions: **(12)**

(i) What led to the bet that was taken by the banker and the lawyer?

(ii) How was the night on which the banker proceeded to kill the lawyer?

(ii) What did the Loisel Couple decide to do when they found the necklace missing?

(iv) Why do you know about Mrs. Sharidaw as pictured in the Garden Party?

HUM 125/URP

6. Recast and correct any ten of the following sentences: **(20)**

   (i) They made less mistakes with the new Calculating machine.

   (ii) Walt Whiteman occupies a most unique place in literature.

   (iii) The jury is arguing among itself.

   (iv) It was them who was to do the work.

   (v) This is the case what I want.

   (vi) Both of the mouse is underfed.

   (vii) Abraham Lincoln was one of the greatest man in American history.

   (viii) He is something better today.

   (ix) He didn't speak but once.

   (x) Dhaka is larger than any city in Bangladesh.

   (xi) This is more square than that one.

   (xii) He is as tall as, if not taller than his brother.

7. (a) Give the meanings of any ten of the following words: **(10)**

   Accost, bellow, chasm, deprecate, extol, grope, hilarious, indictment, ramble, swerve, tributary, wrath.

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

   Admonish, blandishment, credulous, diffidence, flounder, grudge, incidental, malign, obsequious, protrude, quell, sneak.

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

   The first essential feature of civilization is forethought. This indeed is what mainly distinguishes men from brutes and adults from children. But forethought being matter of degree we can distinguish more or less civilized nations and epochs according to the amount of it that they display. And forethought is capable of almost precise measurement. We will not say that the average forethought of a community is inversely proportional to the rate of deforest, though this is a view which might be upheld. But we can say that the degree of forethought involved in an act is measured by three factors: present pain, future pleasure, and the length of interval between them. That is to say, forethought of obtained by dividing the present pain by the future pleasure, and then multiplying by the interval of time between them. There is a difference between individual and collective forethoughts. In certain countries one man can endorse the present pain which another enjoys as the future pleasure. The characteristics works of industrialism show a high degree of collective forethought in this sense. For instance, those who make railways or ships are doing something of which the benefit is reaped year lates.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   BURP Examinations 2020-2021

Sub : **HUM 171** (Microeconomics)

Full Marks : 210   Time : 3 Hours

The figures in the margin indicate full marks.

Symbols indicate their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) 'People buy more when commodity price falls and vice versa'. Explain this statement with the help of 'income effect' and 'substitution effect' of a price change. (Use both numerical and graphical presentations).   (25)

   (b) What is the condition for consumer equilibrium for a single commodity? Mathematically derive the condition.   (10)

2. (a) Assume that the government decides to lift many a poor family's level of utility or consumption from their present indifference curve (say, IC-1) to a higher indifference curve (say, IC-2).   (25)

   (i) How can the government do this by subsidizing the family's consumption (i.e., reducing part of the price like food sale on trucks by TCB) of food?

   (ii) What would be the cost of this program to the government per "typical" poor family?

   (iii) How else could the government achieve the same result? What would be the cost here?

   (iv) Why might the government still choose the more expensive program to achieve the desired results?

   (b) Illustrate the concepts of 'consumer surplus' and 'producer surplus'. Describe the applications of consumer surplus in your own words.   (10)

3. (a) Explain what is meant by (i) constant returns to scale, (ii) increasing returns to scale, and (iii) decreasing returns to scale. Briefly describe how each of these might arise.   (25)

   (b) What is meant by revenue in economics? Explain the conditions for profit maximization of a firm.   (10)

4. Write short notes on any THREE of the following: (35)

   (a) Basic economic problems

   (b) Short run and long run cost curves

   (c) The optimum combination of factors

   (d) Law of diminishing marginal product

HUM 171/URP

SECTION – B

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

5. (a) What are the assumptions of a perfectly competitive market? Explain. (10)

(b) Illustrate the short run equilibrium of a firm under perfect competition. (15)

(c) From the following revenue and cost functions, calculate the profit maximizing level of output and maximum profit. (10)

$$R = 100Q - Q^2$$

$$C = \frac{1}{3}Q^3 - 7Q^2 + 111Q + 90$$

6. (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

7. (a) What is marginal rate of substitutions (MRS)? Distinguish between price consumption curve and income consumption curve. (15)

(b) What do you know about the cardinalist and the ordinalist approaches to utility analysis? Prove that the equilibrium conditions are identical in the cardinalist approach and in the ordinalist (indifference curve) approach. (20)

8. (a) What are the main causes of shifting of the demand curve? (15)

(b) How would you derive the market demand curve of a commodity? Explain graphically. (10)

(c) What are the exceptions to the law of demand? Explain. (10)