

SECTION – A

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

1. (a) Consider a national system where the largest, second largest and third largest city in urban hierarchy are 'L', 'S' and 'T' respectively. Their positions in urban hierarchy remain unchanged over the years. 'L' and 'S' had a population of 180,000 and 75,000 respectively in the year 2000. Is 'L' a primate city? In 2010 the population of 'L' decreased by 40,000. The population of S remained same. Is 'L' a primate city now? Justify your answer. (4+4=8)
- (b) In the same national system as of (a), 'S' has a population of 115,000 in 2020. What will be the population of 'T' if rank-size rule is applied? What should be the minimum population of L if 'L' is the primate city? (5+3=8)
- (c) 'Both rural push and urban pull factors contribute to rural-urban migration and consequently lead to urbanization'- do you agree with this statement? Explain your reasons. (14)
- (d) Explain why both the variation in the net migration rates of each successive development phase and the duration of each successive growth phase decrease over time in the urbanization cycle. (5)
2. (a) Liliputians are the citizens of the city of Liliput. In 1699, there were 10,000 Liliputs. By 1715, Liliputians increased by 5,000. During this period, 5,500 Liliputian babies were born and 4,300 Liliputians died. Determine the net migration of Liliput in this period. (8)
- (b) (i) Write down some of the similarities and dissimilarities between a suburb and a CBD. (4+3+4=11)
- (ii) How do you think a suburb is different from a satellite town?
- (iii) Do you think the concept of Corridor Plan has any similarity with the concept of satellite town? Explain your answer.
- (c) 'Urbanization is a four dimensional process'- explain this statement. (16)
3. (a) Explain in brief the reasons of urban population growth. (4)
- (b) Write down the basic principles of vertical city. Explain how Le Corbusier' plan for vertical city attempted to fulfill those principles. (4+8=12)
- (c) 'Circular migration creates a triple-win scenario by benefiting the host town/country, the home town/country and the migrants themselves' – do you agree? Explain your answer. (7)

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- (d) Describe in brief the fundamental elements of the Neighborhood-unit principles. (12)
4. (a) Do you agree with the statements below? Justify your answer. (7)
- (i) A migrant can always be considered as an immigrant/ emigrant.
- (ii) An immigrant/ emigrant can always be considered as a migrant.
- (b) Explain in brief the downsides of linear city planning concept. (7)
- (c) A large number of Bangladeshi people migrate to various countries of the world including the USA, the UK, India, Saudi Arabia, Australia, etc. Explain some of the factors that might be responsible for this migration and the effects of this migration on Bangladesh. (21)

SECTION-B

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

5. (a) Discuss how the human settlements evolved from cave life to city life. (24)
- (b) Write short note on Hippodamus and Hippodamian plan of classical period (1200 B.C – 4th century A.D.). (11)
6. (a) Compare the city administrative systems of Egyptian civilization at Ancient period (3500 B.C – 1000 B.C.) and European civilization at Medieval period (500 A.D. to 1300 A.D.). (20)
- (b) Explain why Agora was developed in Greek cities at Classical period (1200 B.C – 400 A.D.). Describe its planning features. (3+12=15)
7. (a) Describe different features of town planning in Medieval period (500 A.D. to 1300 A.D.). (25)
- (b) What type(s) of city is Dhaka based on Bergel's modified classification of cities? – Explain. (10)
8. (a) Describe different city forms and their benefits in light of examples from settlements developed in different civilization at pre-industrial period. (20)
- (b) "Climate has always been an important factor influencing the settlement pattern since Ancient period."- Explain with respect to settlement developed in pre-industrial period. (15)
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SECTION – A

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

1. (a) Describe the assumptions of the cardinal approach to utility analysis. What is the basic difference between the cardinal and ordinal approaches to utility analysis? (10)
 (b) Using the axiom of diminishing marginal utility, draw the demand curve of the consumer. (10)
 (c) Prove that the equilibrium conditions are identical in the cardinalist approach and in the indifference-curve (ordinalist) approach. (15)
2. (a) Distinguish between the concepts of consumer surplus and producer surplus using graphical and mathematical presentations. (10)
 (b) Discuss the uses and application of consumer's surplus in economics. (10)
 (c) The demand and supply functions are (given respectively) (15)
 $P = 36 - X^2$ and $4P - 6 = X^2$
 (P refers to price and X to quantity)
 Calculate consumer surplus and producers surplus.
3. (a) Illustrate the concept of marginal rate of substitution (MRS) and describe the relationship between MRS and marginal utility (MU). (15)
 (b) What do you understand by a price effect? Explain with an example. Graphically show, how a price effect is split into its two components. (20)
4. Write short note on any **THREE** of the following: (35)
 - (i) Cross-price elasticity and Engle's law
 - (ii) Basic economic problems
 - (iii) Market demand curve and market equilibrium
 - (iv) Budget line, income-consumption curve and price-consumption curve.

SECTION-B

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

Symbols have their usual meaning.

5. (a) What are the assumptions of a perfectly competitive market? Explain. (10)
 (b) Explain the long run equilibrium of a firm under perfect competition. (15)

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

$$R = 1200Q - 2Q^2$$

$$C = Q^3 - 61.25 Q^2 + 1538.5Q + 2000$$

6. (a) Complete the following table and sketch the graph explaining the relations among the various short run cost curves. (15)

Quantity of output	Total fixed cost	Total variable cost	Total cost	Average fixed cost	Average variable cost	Average total cost	Marginal cost
1	70	30					
2	70	40					
3	70	45					
4	70	55					
5	70	75					
6	70	120					

(b) How would you derive the long run average cost (LAC) curve of a firm from its short run average cost curve? Explain graphically. (10)

(c) A manufacturer has a fixed cost of \$60,000 and a variable cost of \$2.50 per unit made and sold. Selling price is \$5 per unit. (10)

(i) Find the revenue, cost and profit functions using q for the number of units.

(ii) Compute profit if 150000 units are made and sold.

(iii) Compute profit if 1500 units are made and sold.

(iv) Find the break-even quantity.

(v) Construct the break-even chart. Label the cost and revenue lines, the fixed cost line, and the break-even point.

7. (a) What do you understand by localization of industries? What are the causes of localization of industries? (10)

(b) Explain the advantages of division of labour. (15)

(c) What do you understand by division of labour? Explain different types of division of labour. (10)

8. (a) Why is there no unique supply curve for the monopolist derived from its marginal cost curve? (10)

(b) What are the relation among marginal revenue (MR), price (P), and price elasticity of demand (e) of a firm under monopoly? (10)

(c) Explain the short run equilibrium of a firm under monopoly. (10)

(d) What are the conditions of equilibrium of a firm? (5)

SECTION – A

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

1. (a) Briefly describe the dual nature of the electron. Determine the de Broglie wavelength (in nm) associated with a neutron traveling at a speed of 5.0×10^3 m/s. The mass of a neutron is 1.67×10^{-24} g. Comment on your answer. (10)
(b) Which of the following represent valid sets of quantum numbers? For a set that is invalid, explain briefly why it is not correct. (i) $n = 3, l = 1, m_L = 0$, (ii) $n = 2, l = 1, m_L = 0$, (iii) $n = 6, l = 5, m_L = -1$, (iv) $n = 4, l = 3, m_L = -4$. (10)
(c) What are nodes in orbitals? How many spherical nodes can exist in 2s and 3s orbitals? Sketch the orbitals along with the respective radial probability graphs and show the nodes. How does electron get from one side to the other side of the orbitals through the nodes? (9)
(d) Solution of the Schrodinger equation $H\Psi = E\Psi$ can generate the values of Ψ^2 . What are the physical significance of Ψ^2 ? (6)
2. (a) Predict the geometries of the following species using the VSEPR method: (i) PCl_3 , (ii) ICl_3 , (iii) SiH_4 , (iv) XeF_4 , (v) IF_4^- . (10)
(b) Using MOT concept, predict which one in each of the following pairs has greater bond order? (i) N_2 and N_2^+ , (ii) O_2 , O_2^- , O_2^+ . (10)
(c) Why is it impossible for an isolated atom to exist in the hybridized state? Predict the hybridization states of the central atoms in the following molecules and explain the chemical bonding using VBT. (i) N_2F_2 , (ii) NO_2 . (9)
(d) What is lattice energy? Explain how the lattice energy of an ionic compound such as KCl can be determined using the Born-Haber cycle. (6)
3. (a) Surface temperature of the Earth is primarily influenced by a few factors. Name all of them and describe any two factors. (10)
(b) If there is no green house effect, the average temperature of the Earth would be -15°C . Assuming the albedo is 30% and the solar constant 1372 W/m^2 , determine the greenhouse effect that keep the temperature of the Earth $+15^\circ\text{C}$. (10)

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Contd... Q. No. 2

- (c) Atmospheric pressure can be calculated using barometric formula. Calculate the volume of 29 g air in thermosphere (at 100 km altitude, and at -50 °C). Note that the atmospheric pressure at a certain height can be calculated using barometric formula. (9)
- (d) How would you compare bromine and chlorine radicals for the depletion of ozone layer? State at least two comparisons. (6)
4. (a) Explain the point source and nonpoint source pollution of water. What are the major causes of nonpoint source pollution? Explain how the warm water alone can act as a pollutant. (10)
- (b) Chromium (Cr^{3+}) can pollute water via chemical run off. What are the potential sources of Cr^{3+} you can think of? (8)
- (c) What are the natural and manmade causes of acid rains? How does acid rain affect soil chemistry to cause soil degradation? (9)
- (d) There is a saying about ozone – ‘good up high, bad nearby’. Justify this quote. (8)

SECTION – B

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

5. (a) Discuss the oxidative and photochemical degradation processes of pesticides. List the factors which influence which the degradation of pesticides? (11)
- (b) How does the use of pesticides affect the environment? (10)
- (c) Discuss the working function of soap. (9)
- (d) Why are detergents better cleansing agents than soaps? (5)
6. (a) Why is PVC a flame retardant? Identify the health hazards associated with the use of PVC? (10)
- (b) Discuss the roles of bacteria in nitrogen cycle? What effects do fertilizers have on the nitrogen cycle? (11)
- (c) State the physical and chemical parameters of water quality? (5)
- (d) What is the main cause of eutrophication? How does eutrophication affect an aquatic ecosystem? (9)

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7. (a) Differentiate between radioactive decay and nuclear transmutation? Why does nuclear fusion give more energy than nuclear fission? (6)
- (b) One of the nuclides in each of the following pairs is radioactive; the other is stable. Which one is radioactive and which one is stable? Explain. (6)
- (i) $^{102}_{47}\text{Ag}$, $^{109}_{47}\text{Ag}$ (ii) $^{204}_{82}\text{Pb}$, $^{204}_{85}\text{At}$ (iii) $^{204}_{84}\text{Po}$, $^{209}_{83}\text{Bi}$
- (c) What is binding energy and mass defect? Calculate the nuclear binding energy of ^4_2He (atomic mass 4.0026 amu) and the corresponding nuclear binding energy per nucleon. (proton mass: 1.007276 amu, neutron mass: 1.008665 amu) (10)
- (d) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is strongly paramagnetic whereas $[\text{Fe}(\text{CN})_6]^{3-}$ is weakly paramagnetic. Explain. (7)
- (e) Define ionic radius. List the following ions in order to decreasing ionic radius and explain: N^{3-} , Na^+ , F^- , Mg^{2+} , O^{2-} . (6)
8. (a) (i) What determines the strength of an oxoacid? (6+5)
- (ii) How does the common ion effect affect the solubility?
- (b) What are the different types of buffers? How would you prepare a liter of "carbonate buffer" at a pH of 10.10? You are provided with carbonic acid (H_2CO_3 , $K_a = 4.2 \times 10^{-7}$), sodium hydrogen carbonate (NaHCO_3 , $K_a = 4.8 \times 10^{-11}$) and sodium carbonate (Na_2CO_3). (10)
- (c) How do the chemical properties of oxides change as we move across a period from left to right and as we move down a particular group? (6)
- (d) Predict the pH (>7, <7, or 7) of the aqueous solutions containing the following salts: (8)
- (i) AlCl_3 , (ii) NaCN (iii) KCl (iv) $(\text{NH}_4)_2\text{SO}_4$

SECTION – A

There are **FOUR** questions in this section. Answer Question No. 1 and any **TWO** from the rest.

1. (a) Explain with reference to the context any one of the following: (8)
- (i) “Capital punishment kills a man at once, but lifelong imprisonment kills him slowly. Which executioner is more humane....?”
 - (ii) “The Minister of Public Instruction and Madam Ramponneau ask the honour of Mr. and Mrs. Loiseles’ company Monday evening, January 18, at the Minister’s residence”.
- (b) Answer any one of the following: (10)
- (i) Based on the story of “The Bet” make a critical note on the lawyer’s progress to the state of spiritual perfection.
 - (ii) Do you think that ‘The Garden Party’ illustrates Katherine Mansfield’s class-consciousness? Substantiate your answer with reference to the story.
- (c) Answer any three of the following: (12)
- (i) What was Laura’s impression at the sight of the dead man?
 - (ii) Describe the condition in which the banker found the lawyer when he proceeded to kill him.
 - (iii) What were the things that the lawyer was allowed to enjoy during his imprisonment?
 - (iv) What was the reason for Mrs. Loisel’s being unhappy in life?
2. Recast and correct any ten of the following sentences: (20)
- (i) My elder sister was an alumnus of BUET.
 - (ii) They made less mistakes with the new calculating machine.
 - (iii) I was in a dilemma about what to have for dinner.
 - (iv) The jury is arguing in itself.
 - (v) It is I who is next.
 - (vi) If I were him I should not accept the post.
 - (vii) Last week our clergyman reminded us that living the upright life was a discipline.
 - (viii) If Mary was here now she would show you how to cook.
 - (ix) He is something better today.
 - (x) Erosion is where the soil is washed away.
 - (xi) The guard didn’t barely touch the player.
 - (xii) He is as tall as, if not taller, than the teacher.

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3. (a) Give meanings of any ten of the following words: (10)
Abhor, beckon, circumspectly, divulge, flip, grouchy, indictment, menace, nadir, rancor, tepid, wrath.
- (b) Make sentences with any ten of the following words: (10)
Arduous, brandish, congenital, diffidence, feud, garrulous, intrepid, obsequious, placate, rebut, sinuous, tributary.
4. Write a précis of the following passage with a suitable title: (20)
We must build a world of peace and we cannot do so unless we secure for it a truly moral foundation. We may hold different metaphysical views, adopt different modes of worship, and there are millions today who do not desire to place their faith in any God at all. But every one of us will feel highly offended if he is pronounced destitute of any moral sense, if he is said to be untruthful or unloving. All religions or systems of morality agree that respect for life, respect for intangible possession, good name and honour constitute morality and justice. 'Do not do to others what you would like to be done to you'. Even primitive sages accept this principle. Only for them its appreciation is limited to their own tribe and race and those outside are not regarded as human beings. As our horizon expands, as our moral sense deepens, we feel that this moral precepts are valid for all human beings. Today the world is like a ship with no captain heading for the rocks. It is swept by passion and folly. We do not know whether it is passing through birth pangs or death throes. If we adopt the path of greed, hatred and self interest, we will become something less than human. If we take the other path of fortitude, unselfish service and sacrifice, we will reach the height of splendour in body, mind and spirit of which we can hardly dream. Non-religion is our malady and religion, as an adventure of spirit and as a tool of radical transformation of human nature, is the cure for it.

SECTION-B

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

5. Read the following passage carefully and answer the questions that follow: (30)
The journey from irresponsibility to responsibility is full of hazards. Every individual first encounters his problems of security and personal significance while he is still a helpless infant. His first efforts to get what he wants are made long before he enjoys either independence or competence. They are, therefore, directed at getting other people to give him what he wants. Thus, at the most vulnerable time of his life, he faces a double danger: of consolidating habits of "successful" dependence upon others, so that he never finds a sufficient motive for growing into mature respectably; or of experiencing so much frustration that his natural drive towards independence is replaced either by a submissive acceptance of whatever happens or by an aggressive resistance.

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Contd... Q. No. 5

We know that many irresponsible adult behaviours stem from causes other than their apparent causes. The person who is never on time, for example, even though he consciously tries for punctuality, may be expressing an unconscious resentment carried over from childhood: resentment, perhaps, against stringent rules of 'niceness' and orderliness that set him apart from his playmates and won him the label of sissy. The bumbling person who seems pitifully to fail and fail again, in spite of honest effort, may unconsciously want to fail – because failure allows him to remain in some measure dependent.

Man, in brief, does not grow automatically from dependence to independence, helplessness to competence, irresponsibility to responsibility. But the linkage with life brought about by such growth is indispensable to maturity.

Questions:

- (i) What is the double danger?
 - (ii) What is the outcome of stringent rules and restriction upon childhood practices?
 - (iii) How does the journey to maturity take place?
 - (iv) What is the cause of irresponsible adult behavior?
 - (v) Why does someone like to fail?
 - (vi) Give the meanings of the following words as used in the passage: Encounter, vulnerable, resentment, bumbling, indispensable.
6. (a) Suppose you are the Assistant Engineer of a company. Draft a suitable complaint letter about having received defective goods from your supplier. (Provide other details from your own). (10)
 - (b) Write phonetic transcriptions of the following words: (Any five) (10)
Abstract, decade, colonel, local, paper, mother.
 7. (a) Write a dialogue between two students of URP department about the high rise building culture in Bangladesh. (10)
 - (b) Write a short essay on any ONE of the following: (10)
 - (i) Virtual Friendship: A New Trend in Cyber World
 - (ii) Dilemma of Modern Man.
 - (iii) Green Earth Fresh Heart
 8. (a) Transform the following sentences as directed (Any five). (10)
 - (i) The officer acknowledged his mistake. (make it Complex).
 - (ii) I know the reason why he kept silent. (Simple).
 - (iii) Being tired, he fell asleep. (Compound).
 - (iv) This is the venue of the meeting. (Complex).
 - (v) Be just and fear not. (Complex).
 - (vi) You must avoid fat or you will not lose weight. (Simple).
 - (b) Write short note on any TWO of the following: (10)
 - (i) The Diphthongs
 - (ii) Barriers to Communication
 - (iii) Elements of structure of a formal report.