

Sub: **CE 209** (Construction Materials and Civil Engineering Structures)

Full Marks: 140

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) Briefly describe various field tests for bricks. (6)
- (b) Write down the characteristics of good bricks. (5)
- (c) Draw a neat sketch of timber section and show different parts of it. (6)
- (d) Describe cement manufacturing process (wet process) with flow diagram. (6 $\frac{1}{3}$)

2. (a) Define and explain the following terms: (5×3=15)
 - (i) Bulking of sand
 - (ii) False setting of cement
 - (iii) Bleeding of concrete
 - (iv) Slump test of concrete
 - (v) Fiberglass Reinforced Plastic (FRP)
 (b) Briefly describe different types of sands according to source and mention their uses. (8 $\frac{1}{3}$)

3. (a) Write down the main differences between cement and lime. (4)
- (b) Describe different parameters that control strength, durability, permeability and workability properties of concrete. (8)
- (c) Define workability of concrete. How can you measure workability of concrete in construction site? (6)
- (c) Briefly describe the setting time test and soundness test of cement paste. (5 $\frac{1}{3}$)

4. (a) Write down the properties and uses of cast iron. (6)
- (b) Briefly describe the engineering properties of plastics. (6)
- (c) Write down the advantages of concrete over other materials of construction. (6)
- (d) Show graphically the effect of age on concrete strength for ordinary portland cement, rapid hardening cement and sulphate resisting cement. (5 $\frac{1}{3}$)

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SECTION-B

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

5. (a) Describe different types of foundation with neat sketches. **(8)**
(b) Differentiate between flexible and rigid pavement. **(8 1/3)**
(c) Describe with neat sketches basic structural elements of flexible pavement. **(7)**
6. (a) Write short notes on the following topics: **(4×4=16)**
(i) Balanced cantilever bridge
(ii) Sub-surface irrigation
(iii) Border strip flooding
(iv) Shore pile construction.
(b) Draw phase diagram of weight-volume relationship for soil and hence define void ratio, porosity and degree of saturation. **(7 1/3)**
7. (a) The following table gives the values of consumptive uses and effective rainfalls for the periods shown against them, for a Jowar crop sown at Dinajpur district. The period of growth is from 16th October to 2nd February. Determine the volume of water (liter) required to be diverted from the head works to irrigate an area of 3000 ha. Given, water application efficiency is 50% and conveyance efficiency is 75%. Assume that water is not required for any other purpose except that of fulfilling the evapotranspiration needs of the crop. Assume reasonable values for missing data, if any. **(12)**

Dates	Consumptive Use, C_u (in mm)	Effective Precipitation, R_e (in mm)
October 16-31	37	30.8
November 1-30	84.2	20.4
December 1-31	154.9	6.7
January 1-31	188.1	2.4
February 1-2	13.3	1

- (b) Draw a typical layout of an irrigation canal network. **(5 1/3)**
(c) Briefly describe necessity of irrigation in context of Bangladesh. **(6)**
8. (a) Briefly describe different types of building on the following basis: **(6)**
(i) Depending on the character of occupancy
(ii) Depending on the load transfer mechanism.

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(b) Briefly state the importance of flood control with respect of Bangladesh.

(5)

(c) A one storied building is to be constructed at Mirpur. The building has been designed as flat plate system with no beams and the floor to floor height is 12 ft. There are 4 columns at each corner with a flat slab of 6 inch thick. The size of each column is 10 inch by 20 inch while the slab is 20 ft by 30 ft. If the concrete mix ratio for constructing both column and slab is 1:1.5:3 (by volume) and water cement ratio is 0.45 (by weight), how many bags of cement are required to prepare concrete for this building? Also find the amount of fine aggregate (FA), coarse aggregate (CA) and water required to prepare the concrete mix. Assume reasonable values for missing data, if any.

(12 1/3)

SECTION – A

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

1. (a) C. Wright Mills defined sociological imagination as the vivid awareness of the relationship between experience and the wider society. Explain the definition with a suitable example. (20)
- (b) Critically discuss the most important aspects of 'Role Theory'. (15)
2. (a) What do you mean by social stratification? How do diverse systems of social stratification facilitate social inequality in society? (15)
- (b) How are you affected globalization? Which aspects of globalization do you find advantageous and which ones objectionable? (10)
- (c) Describe the stages and types of socialization process with appropriate examples. (10)
3. (a) What is culture? Name one culturally significant discovery and one culturally significant invention that occurred in your lifetime. Explain how these innovations have affected the culture to which you belong. (15)
- (b) Critically discuss the modernization theory of development. (10)
- (c) Explain the research design typically used by social scientists. (10)
4. Write short notes on any **THREE** of the following: (35)
 - (a) Safety net program in Bangladesh
 - (b) Absolute poverty
 - (c) Concept of ethnocentrism
 - (d) Vertical social mobility

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SECTION-B

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

5. (a) Define environment. Briefly discuss different types of environment with examples. (10)
(b) What is meant by refuse, reduce, reuse and recycle (4R's)? Give examples. (12)
(c) Briefly discuss the consequences of global warming. (13)
6. (a) Define the terms: Urban area, Urbanization, Urbanism and Over-urbanization. (12)
(b) What are the factors that influence a city's growth? Discuss in detail. (12)
(c) What are the advantages and disadvantages of megacities? (11)
7. (a) Write down the characteristics of pre-industrial, industrial and post-industrial societies. (12)
(b) What do you understand by social change? Briefly describe the sources of social change. (12)
(c) Examine the social consequences of the industrial revolution. (11)
8. Write short notes on any THREE of the following: (35)
(a) Deindustrialization
(b) Different kinds of cities
(c) Positive and negative consequences of capitalism
(d) Types of Crime
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SECTION – A

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

1. (a) Which cul-de-sac pattern should be used in case of steep slope? Describe the design requirements for such cul-de-sac pattern. (8)
- (b) Discuss about the factors that need to be considered in sub-division planning. (21)
- (c) What are the different types of methods for rainwater harvesting? (6)

2. (a) 'Complete segregation' or 'complete aggregation' of different socio-economic groups in a neighborhood unit is not a good design standard — do you agree with the statement? Discuss your answer with necessary example. (8)
- (b) Which pattern of subdivision planning is most economical in respect of land utilization? Discuss the design principles, advantages and disadvantages of this pattern with necessary illustration. (15)
- (c) What are the system set-up requirements for providing water supply for a community? (12)

3. (a) Describe simple grid iron pattern. Write down the names of two layout patterns that are slightly different from pure grid iron pattern and also show comparison between these two layout patterns. (7+10=17)
- (b) Discuss the importance of urban rainwater harvesting in the context of Dhaka city. (8)
- (c) You are planning to install rainwater harvesting system for a tower with roof of circular shape. The diameter of the roof is 10 m and the annual rainfall in the area where the tower lies is 180 cm. Determine the quantity of water that can be collected from roof catchment. (10)

4. (a) Write short notes on: (6×2=12)
 - (i) Advantages of public sewerage system
 - (ii) First flush device
- (b) How can a common courtyard with a small access street play an important role for creating a good housing design? Explain with necessary sketches. (16)
- (c) What are the advantages of loop street pattern? (7)

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SECTION – B

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

5. (a) What do you understand by a 'site' and 'site planning'? "The aim of site planning is moral and aesthetic: to make places which enhances everyday lives — which liberate their inhabitants and give them a sense of world they live in." — Explain the quoted sentence in your own words. (20)
- (b) Describe air movement in different types of sites: (i) near sea-shores, (ii) around buildings, (iii) uphill and downhill areas, (iv) flow of air from forest to plain. (15)
6. (a) 'Analysis of a site begins with a personal reconnaissance, which permits a grasp of the essential character of the place and allows the planner to become familiar with its feature.' — Write down the features, with examples, which are necessary consideration while analyzing a site. (15)
- (b) In perspective of site planning, what are the different ways to control sound? Explain each of them. (10)
- (c) Explain the different shapes of spaces in site planning. (10)
7. (a) You are assigned to plan an educational site. What stages are you going to follow to prepare the plan? (7)
- (b) What are the design criteria for site planning of a planned shopping centre? Describe the typical layouts of designing a planned shopping centre. (20)
- (c) Using diagram, explain how the drainage system of a site should be designed? (8)
8. (a) Discuss the sensuous forms and criteria considered in site planning. (10)
- (b) What do you mean by 'industrial district'? Explain the criteria of selecting a site for industrial district. (16)
- (c) Write short notes on the followings (any three): (3×3=9)
- (i) Grading
 - (ii) Cut and Fill
 - (iii) Maze
 - (iv) Behavioral Support
 - (v) Albedo
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SECTION – A

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

1. (a) Define 'Mutually Exclusive Event' and 'Collectively Exhaustive Event' with examples. (8)

(b) The famous writer, George R.R. Martin, is trying to decide how many copies to print of his upcoming book "The Winds of Winter". Each copy costs \$0.5 to print and sells for \$1.5. Note that, any copy unsold after one year must be discarded. Mr. Martin has estimated the following probability distribution for book sales, using data from his past book sales– (15)

Books Sold (Yearly)	250	400	550	700
Probability	0.10	0.30	0.45	0.15

Mr. Martin has decided to print either 250, 400, 550 or 700 copies. Which number of books will minimize his expected loss?

(c) After conducting a questionnaire survey at Lalbag area of Dhaka, a research team claimed that 60% of the households in the area have a monthly saving of taka 100,000 or more. Assuming the claim is true, compute the probability that in a random sample of 300 households taken from Lalbag area, less than 55% will have a monthly saving of taka 100,000 or more. (12)

2. (a) The mean number of sales per day at a telecommunication center is 10. Employees receive a warning if they make less than 3 sales per day. Find the probability that a randomly selected employee receives warning. (10)

(b) Discuss the characteristics of Normal Probability distribution with necessary illustrations. (10)

(c) A study was conducted in Korail Slum to identify how long families in the slum have lived at their current location. A random sample of 40 families revealed a mean of 35 months. It is known that the population standard deviation is 6.3 months. (10+5=15)

- (i) Construct a 90% confidence interval for the mean time that the families have lived in the present location.
- (ii) Suppose the population standard deviation is not known but you know the sample standard deviation. State the process you would follow in that case to solve this problem. You do not need to calculate.

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3. (a) Differentiate between – (6×2=12)
- (i) Discrete Probability Distribution and Continuous Probability Distribution.
 - (ii) Stratified Sampling and Cluster Sampling.
- (b) The mean score of a statistics class test is 6.7 out of 10 and the standard deviation is 1.2. The course teacher assumed that the scores are normally distributed and announced that the top 10% will earn A⁺. (10+5=15)
- (i) What is the lowest score a student can get to earn an A⁺?
 - (ii) Calculate the percentage of students scoring between 6 and 7.
- (c) A jar contains 5 red marbles, 9 blue marbles and 6 green marbles. You randomly select 3 marbles from the jar. The random variable 'X' represents the number of red marbles. Do you think it is a binomial experiment? Justify your answer. (8)
4. (a) Assume that travel time from New Market to the BUET campus by bicycle is a normal random variable with mean $\mu = 9$ minutes and standard deviation, $\sigma = 3$ minutes. 87% of the bicycle users take less time to reach the campus from New Market than you do. Compute your approximate travel time from New Market to the BUET campus by bicycle. (15)
- (b) Suppose a study revealed that houses in Dhanmondi Residential Area are sold at a rate of 1.02 houses per day. On an average, 13.3% of the houses sold were built before 2005 and we are denoting such houses as "old". Real Estate Agent Mr. Robi noticed that the number of houses (old and new), and the number of buyers and sellers in the market are very large compared to the number of sales that typically occur in a month. Therefore, he adopts the following assumptions: Ages of houses sold are independent of one another, and the number of sales, and the time until the next sale, are independent across time periods. Based on these assumptions, answer the following questions– (10+10=20)
- (i) Find the probability that exactly one of the next seven houses sold will be "old".
 - (ii) Find the probability that exactly eight houses will be sold in the next week.

SECTION-B

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

Terms have their usual meanings. You need to show the process for deriving the answer.

5. (a) Explain with example the characteristics of different levels of measurement for data. (20)
- (b) Write short notes on (Any three) (5×3=15)
- (i) Accuracy and Precision.
 - (ii) Censored data.
 - (iii) Variable.
 - (iv) Skewness of data.

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6. (a) In a city of Bangladesh, if a household could buy a house paying not more than five (05) times of its average annual income then it is called 'affordable housing'. City authority gives tax rebate for companies which offer affordable housing. To get rebate for affordable housing, the average price of flat of the company must meet the definition of 'affordable housing' mentioned above. 'House for all' – a real estate company applied for tax rebate for their housing project in 2016. City authority conducted a survey on flat price of a project of 'House for all'. The result is shown in the following Table (Table 01)

Table 01: Price Range of Flats sold by "House for all".

Price range (in Utopian Taka)	No. of flats sold
79,500 – 84,500	09
84,500 – 89,500	15
89,500 – 94,500	26
94,500 – 99,500	30
99,500 – 104,500	13
104,500 – 109,500	05
109,500 – 114,500	02

- (i) If the average household income in 2016 in that city was 18,900 taka, would "House for all" be eligible for tax rebate? Justify your answer. **(10+5=15)**
- (ii) "Commoners Bank" in that city is offering interest free loan for housing. The condition of the loan is that, the price of the flat must not be over 95% of the median price of the housing project. How many flats can be financed by "Commoners Bank" for the project mentioned in table 01? **(10)**
- (b) The following table (Table 02) provides waiting time for cars in an intersection of Dhaka. **(10)**

Table 02: Waiting time for Cars (in seconds)

Direction	Waiting time (in seconds)
North to South	52, 65, 68, 42, 52, 52, 54, 58, 77, 51
North to East	52, 55, 59, 62, 58, 54, 52, 60, 54, 57
North to West	54, 65, 42, 44, 66, 53, 72, 70, 52, 75

Describe from the table for which direction it is expected that the car would wait longest.

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7. "Dream Builders" constructs buildings for various purposes. Table 03 provides per square meter cost in taka for the last few projects of "Dream Builders".

Table 03: Cost/square meter for construction by "Dream Builders" in Taka.

89	112	106	89	96
95	102	99	91	102
105	96	88	90	101
113	98	95	98	93
86	85	91	82	94
105	98	92	98	96
106	101	98	97	104
81	107	104	99	104

- (a) Construct a 'stem and leaf' diagram for the dataset. (10)
- (b) Develop a frequency distribution table with equal interval class setting using the dataset. (15)
- (c) Construct a histogram based on the frequency table developed in question No. 7(b). (10)
8. (a) In cricket, higher average runs indicate better batsman while lower standard deviation indicates consistent scorer of run. Table 04 provides the run scored by four batsman in last ten completed innings.
- (i) Who is the best batsman of the four? (10)
- (ii) Who is more consistent scorer of runs of the four batsmen? (10)

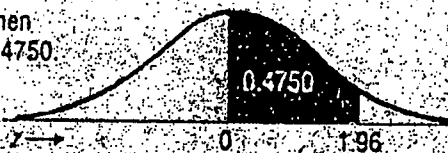
Table 04: Runs scored by Four Batsmen in last 10 innings

Name of Batsman	Score in last 10 innings
Minhaz	40, 24, 28, 08, 32, 45, 67, 21, 87, 48,
Nur	55, 02, 00, 56, 65, 00, 12, 09, 21, 75
Shahid	09, 22, 32, 32, 12, 43, 25, 43, 40, 47
Alok	07, 23, 54, 44, 55, 17, 26, 42, 09, 93

- (b) Differentiate between – (5×3=15)
- (i) Sample and Population.
- (ii) "Dependent and Independent Variable.
- (iii) Discrete and Continuous Data.

Areas under the Normal Curve

Example:
If $z = 1.96$, then
 $P(0 \text{ to } z) = 0.4750$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

SECTION – A

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

1. (a) Briefly describe the features to be considered while planning a neighborhood unit. (10)
 (b) How can one define the population size and a real extent of a residential neighborhood? Describe with apposite examples. (17)
 (c) What is urban sprawl? On contrary to urban sprawl, how does the concept of smart growth act? (8)

2. (a) What are the principles of designing a town centre? In order to make the town centre most accessible and attractive place, as a planner which three principles will you emphasize on? (20)
 (b) Which factors need to be considered for the location and growth of an industry? (10)
 (c) Give a brief description of the major land use element which is considered as an intermediate zone between urban and rural area. (5)

3. (a) Explain the emergence of policy for guiding the location of industries. From your perspective which measure(s) may act effectively in order to control the concentration of specialized industries in an existing urban centre. Give your justification. (14)
 (b) Under the basic principles of land use planning, how can you allocate the organize land uses and activities in a compatible and sustainable manner? (12)
 (c) Write down the obstacles towards better urban planning in the context of Dhaka city. (9)

4. (a) What do you understand by the terms "pedestrian precinct", "pedestrian ways" and "shopping arcade"? Give appropriate examples. (12)
 (b) Discuss the classifications of residential density. Also describe the effects of excessive and insufficient density in a residential area. (4+12=16)
 (c) "The functional efficiency of a city largely depends on the pattern of linkage and the ease of movement." — Explain the statement. (7)

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SECTION – B

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

5. (a) Distinguish between the terms "Land Cover" and "Land Use". (5)
(b) Our historic past is eroded both by human and natural forces — explain this statement. (6)
(c) A number of tools are practiced for conservation of historic buildings and sites. Discuss the following tools with relevant examples— (12)
(i) Restoration (ii) Adaptive use (iii) Replication.
(d) Why is it important to consider tourism management during conservation of historic sites? Discuss the major problems associated with conservation in Bangladesh. (4+8=12)
6. (a) According to Le Corbusier, what are the functions of settlements? Discuss his concept of city planning. (3+5=8)
(b) Briefly discuss different categories of open spaces and the basic purposes they serve. (9)
(c) Compare the features of "Concentric Zone" theory with "Multiple Nuclei" theory. Explain with examples. (12+6=18)
7. (a) Discuss the nature of contemporary urbanization trend in Bangladesh. (12)
(b) Briefly discuss the assumptions of Huff's model and elaborate with an example. (11)
(c) Do you think some of the characteristics of contemporary commercial development in Dhaka are detrimental from environmental and social perspectives? Elaborate your opinion. (12)
8. (a) Briefly discuss locational requirement for employment areas. (9)
(b) Open spaces are very useful in terms of physical, economic, environmental and social point of view. Explain in the context of Dhaka. (17)
(c) "Town Planning is not mere place-making, nor even work planning. If it is to be successful it must be folk planning" — who delivered this statement? Explain his principles for town planning. (2+7=9)
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