

L-1/T-1/URP

Date: 25/5/2024  
30/03/2024

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 BURP Examinations 2022-2023

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

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) "Urbanization is generally regarded as a four-dimensional process." — Explain this statement with relevant examples. (4×5=20)  
(b) Describe the following terms: (3×5=15)
  - (i) Megalopolis
  - (ii) Fringe Area
  - (iii) Central Business District
2. (a) In the history of 400 years, the growth of Dhaka did not follow the same pattern. At times, the city declined and then regenerated again. Briefly discuss the underlying factors of Dhaka's rapid growth and decline in the past. (10+10=20)  
(b) Describe the human settlement pattern of Dhaka after the emergence of Bangladesh. (15)
3. (a) Outline the differences between cities of Bengal during medieval and colonial periods with respect to physical, social and economic factors. (20)  
(b) Briefly describe the town-planning features of ancient Mahasthangarh. (15)
4. (a) Explain how several physical factors had influenced the location of settlements in Bangladesh. (10)  
(b) Briefly describe the challenges of urbanization in the context of Bangladesh. (15)  
(c) "The town planning of Mohenjo-Daro was ahead of its time." — Explain this statement. (10)

Contd ..... P/2

PLAN 111

SECTION – B

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

5. (a) Vancouver Declaration defined human settlements as the totality of the human community. Briefly state your understanding about human settlement in light of the Vancouver Declaration. (15)
- (b) Illustrate the concept of the "Linear City" with necessary sketches. (12)
- (c) Outline the differences between the open spaces of the Renaissance period and that of the Baroque period. (8)
6. (a) Write about the factors that influenced the formation of static urban settlements. Consider the factors from Mesolithic to Iron age. (15)
- (b) Briefly explain the settlement pattern of ancient 'Ur'. (20)
7. (a) Clarence Stein and Henry Wright's neighborhood units can form a town. Explain the statement with necessary diagrams. (13)
- (b) Pharaoh Akhenaten's religious belief shaped the development of his new capital in Tell El-Amarna. Explain the statement. (12)
- (c) Describe the key features of Greek dwellings of the classical period. (10)
8. (a) "Planning emerges out of series of crises and people's response to them." Interpret the statement in light of the following two movements—
- (i) The Parks Movement, (10)
- (ii) The Garden City Movement. (13)
- (b) Explain Chinese geomancy, with necessary sketches, in the context of city building. (12)
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Sub: **PLAN 163 (Engineering Survey and Cartography)**

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** questions.

1. (a) Define map scale. Compute the Representative Fraction (RF) of a map if two points located 10 km apart on earth are shown 1cm apart on the map. (3+4)  
(b) Define cartogram. Explain different types of cartogram with relevant example. (3+10)  
(c) Explain the principles of GPS operation and location identification with relevant diagram. (15)
2. (a) Demonstrate the difference between Geographic Coordinate System (GCS) and Projected Coordinate System (PCS) with relevant examples. (7)  
(b) Explain the different types of map projection based on distortion of map features with relevant illustration. (13)  
(c) Describe the underlying principle and techniques of improving accuracy of GPS Survey. (15)
3. (a) Demonstrate why the Universal Transverse Mercator (UTM) projection prefer a transverse orientation of the projection plane over a normal orientation. (15)  
(b) Define mobile mapping. Describe the advantages and disadvantages of mobile mapping. (5+15)
4. (a) Define web map and interactive map. Describe the basic elements of web map. (5+10)  
(b) Illustrate the issue of generalization, simplification, and abstraction with relevant examples. (20)

**PLAN 163**

**SECTION – B**

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

5. (a) How can drone survey be useful for urban and regional planning? You are expected to use examples to justify your points. **(15)**
- (b) The following data were obtained from a survey of a parcel of land. Draw a sketch and calculate the area of the land using Simpson's Rule. **(20)**

Chainase(Meter)	0	15	30	45	60	75	90	105
Offset (Meter)	8.0	9.5	10.2	9.8	10.6	11.4	8.7	7.0

6. (a) Explain three methods of chaining along a sloping ground. **(20)**
- (b) Describe how errors can happen in chain survey. **(15)**
7. (a) Explain three methods of plotting a pentagonal closed traverse. **(20)**
- (b) Write the characteristics of a closed traverse. **(15)**
8. (a) Explain the purpose of change if points and the steps taken at these points. **(15)**
- (b) A section line AB appears to be 10.16cm on a photograph for which the focal length is 16cm. The corresponding line measures 2.54cm on a map, which is to be scale of 1: 50,000. The terrain has an average elevation of 200m above means sea level. Calculate the flying altitude of the air craft above mean sea level when the photograph was taken. **(20)**

The figures in the margin indicate full marks.

Symbols used have their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

**SECTION – A**

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

1. (a) In studios and on stages, cardioid microphones are often preferred for the richness they add to voices and for their ability to reduce the level of sound from the sides and rear of the microphone. Suppose one such cardioid pattern is given by the equation  $(x^2 + y^2 - x)^2 = x^2 + y^2$ . (10)
- (i) Find the intercepts of the graph of the equation.
- (ii) Test for symmetry with respect to the x-axis, y-axis and the origin.
- (b) The function  $f$  is defined as  $f(x) = \begin{cases} -2x+1 & \text{if } -3 \leq x < 1 \\ 2 & \text{if } x = 1 \\ x^2 & \text{if } x > 1 \end{cases}$  (10)
- (i) Find  $f(-2)$ ,  $f(1)$  and  $f(2)$ .
- (ii) Locate any intercepts.
- (iii) Graph  $f(x)$  and determine the domain and range of  $f(x)$ .
- (iv) Is  $f(x)$  continuous on its domain?
- (c) Analyze the graph of polynomial function  $f(x) = (2x+1)(x-3)^2$ . (15)
2. (a) Suppose that  $g(x) = 3x^2 - 2x + 3$ . (10)
- Find the average rate of change of  $g(x)$  from  $-2$  to  $1$ .
- Find an equation of the secant line containing  $(-2, g(-2))$  and  $(1, g(1))$ .
- (b) Determine the function that will be finally graphed after the following tree transformations are applied to the graph of  $y = |x|$ . (10)
- (i) Shift left 2 units, then
- (ii) Shift up 3 units, and then
- (iii) Reflect about the y-axis.
- (c) The quantity supplied of a good is the amount of a product that a company is willing to make available for sale at a given price. The quantity demanded of a good is the amount of a product that consumers are willing to purchase at a given price.

**MATH 105/URP**

**Contd... Q. No. 2(c)**

Suppose that the quantity supplied,  $S$ , and the quantity demanded,  $D$ , of cellular telephones each month are given by the following functions:  $S(p) = 60p - 900$ ,  $D(p) = -15p + 2850$ , where  $p$  is the price (in dollars) of the telephone. (15)

- (i) Find the equilibrium price of cellular telephones. What is the equilibrium quantity, the amount demanded (or supplied) at equilibrium price?
- (ii) Graph  $S = S(p)$  and  $D = D(p)$ , and label the equilibrium point.

3. (a) Find the horizontal or oblique asymptote, if exists, of the graph of

$$H(x) = \frac{3x^4 - x^2}{x^3 - x^2 + 1}. \quad (10)$$

(b) Analyze the graph of the rational function  $R(x) = \frac{x-1}{x^2-4}$ . (15)

(c) The resident population of the united states in 2014 was 317 million people and was growing at a rate of 0.7% per year. Assuming that this growth rate continues, the model  $P(t) = 317(1.007)^{t-2014}$ . (10)

According to this model, when will the population of the united states be 400 million? When it will be doubled?

4. (a) Solve the following system: (20)

$$\begin{aligned} 4x_1 + x_2 + x_3 + x_4 &= 6 \\ 3x_1 + 7x_2 - x_3 + x_4 &= 1 \\ 7x_1 + 3x_2 - 5x_3 + 8x_4 &= -3 \\ x_1 + x_2 + x_3 + 2x_4 &= 3 \end{aligned}$$

by Cramer's rule and by Guass-Jordan elimination.

(b) Find the rank and nullity of the matrix. (15)

$$A = \begin{pmatrix} -1 & 2 & 0 & 4 & 5 & -3 \\ 3 & -7 & 2 & 0 & 1 & 4 \\ 2 & -5 & 2 & 4 & 6 & 1 \\ 4 & -9 & 2 & -4 & -4 & 7 \end{pmatrix}$$

Hence, verify the dimension theorem for the matrix  $A$ .

**MATH 105/URP**

**SECTION – B**

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

5. (a) State Cayley-Hamilton theorem. Verify Cayley-Hamilton theorem for the matrix (20)

$$A = \begin{bmatrix} 2 & 2 & -2 \\ 2 & 3 & -1 \\ -2 & -1 & 3 \end{bmatrix} \text{ and hence find } A^{-1}.$$

- (b) Define eigenvalues and eigenvectors of a square matrix. Find the eigenvalues and the eigenvectors of the matrix. (15)

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

6. (a) Determine the relationship between the rectangular coordinate system and the spherical polar coordinate system. Sketch the surface  $\phi = \pi/4$ . (15)

- (b) Find the angle between two diagonals of a unit cube. (20)

Also find the projection of a diagonal to the principal diagonal.

7. Consider the lines (35)

$$\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}, \quad \frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}.$$

- (a) Find the shortest distance between the lines.

- (b) Find the equation of the plane that contains 1<sup>st</sup> line and the shortest distance line.

- (c) Find the equation of the shortest distance line in symmetrical form.

- (d) Find the coordinates of the points between the lines and shortest distance.

8. (a) A plane passes through a fixed point  $(a, b, c)$  and cuts the axes in  $A, B, C$ . Show that the locus of the center of the sphere  $OABC$  is  $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$ . (15)

- (b) Determine the equations of the tangent planes to the sphere  $x^2 + y^2 + z^2 + 6x - 2z + 1 = 0$ , which passes through the line  $\frac{16-x}{2} = \frac{z}{2} = \frac{y+15}{3}$ . (20)

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