BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-1/T-1    B. Arch. Examinations 2022-2023
Sub: **ARCH 133** (Design Theory)
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 **Q. No. 4** and any **TWO** from the rest.

1.  (a) Evaluate 'Line' as primary elements in architecture with examples and sketches.   **(10)**

    (b) Explain how forms can be articulated in design.   **(10)**

2.  (a) Describe the procedures for forming additive form briefly.   **(10)**

    (b) Discuss the characteristics of spaces while they are defined by the elevated base plane.   **(10)**

3.  (a) How 'L-shaped plane' as vertical space defining element defines spaces? Explain it with necessary sketches.   **(10)**

    (b) Identify the characteristics of spaces while they are organized centrally.   **(10)**

4.  Write short notes on the following:

    (a) Visual properties of form   **(10)**

    (b) Spatial relationship between adjacent spaces   **(10)**

    (c) Material proportion.   **(10)**

## SECTION – B
There are **FOUR** questions in this section. Answer **Q. No. 8** and any **TWO** from the rest.

5.  Explain with examples the representation of different emotions through basic geometric shapes in visual art.   **(20)**

6.  Discuss with reference to visual art, how the different attributes of color can alter spatial quality.   **(20)**

7.  "Order without diversity can result in monotony, diversity without order can produce chaos" — relate the statement with reference to different ordering principles.   **(20)**

8.  Write short notes on the following:   **(10×3=30)**

    (a) 'Line' as an element of visual art.

    (b) Explain 'ACTUAL' and 'SIMULATED' texture briefly.

    (c) Hierarchy.

---------------------------------

19|05|2024

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1  B.Arch. Examinations  2022-2023

## Sub: MATH 111 (Mathematics)

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.

Symbols have their usual meaning.

1.  (a) A function $f(x)$ is defined in the way: $f(x) = \begin{cases} \dfrac{1}{x} & ; & x \le -1 \\ x & ; & -1 < x < 0 \\ 1 + x^2 & ; & x \ge 0 \end{cases}$   **(12)**

Discuss the continuity and differentiability of $f(x)$ at $x = -1$ and also represent them graphically.

(b) If $y = e^{m\cos^{-1}x}$ then show that $(1 - x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + m^2)y_n = 0.$, where $y_n$ denotes the n-th derivative of $y$.   $\left(11\frac{1}{3}\right)$

2.  (a) State and prove Euler's theorem on homogenous function. Using the theorem, show that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = \dfrac{1}{2}\tan u$ where $u = \sin^{-1}\dfrac{x-y}{\sqrt{x} - \sqrt{y}}$.   **(13)**

(b) Find the local and global extrema of the function $f(x) = 1 + 2\sin x + 3\cos^2 x$.   $\left(10\frac{1}{3}\right)$

3.  (a) Integrate $\int e^{6x} \sin\left(e^{2x}\right)dx$ using integration by parts formula.   **(10)**

(b) Show that $\int \dfrac{dx}{\sqrt{x^2 - a^2}} = \ln\left(x + \sqrt{x^2 - a^2}\right) + c, (x > a)$.   $\left(13\frac{1}{3}\right)$

4.  (a) Use definite integral to compute: $\lim_{n \to \infty}\left[\dfrac{1}{n} + \dfrac{\sqrt{n^2 - 1^2}}{n^2} + ... + \dfrac{\sqrt{n^2 - (n-1)^2}}{n^2}\right]$   **(10)**

(b) Find the area of the curve bounded by $y^2(2a - x) = x^3$ and its asymptotes.   $\left(13\frac{1}{3}\right)$

## MATH 111 (ARCH)

### SECTION – B

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

Symbols have their usual meaning.

5.  (a) Evaluate the point at which the join of (-9, 4, 5) and (11, 0, -1) is met by the perpendicular from the origin.　**(11)**

(b) Find the locus of the point such that the sum of the squares of its distances from the planes $x + y + z = 0$, $x - z = 0$, and $x - 2y + z = 0$ is 9.　$(12\frac{1}{3})$

6.  (a) Calculate the angle between the lines whose direction cosines are given by $l + m + n = 0$ and $l^2 + m^2 - n^2 = 0$.　**(11)**

(b) Obtain the equation of the plane through the points (2, 2, 1) and (9, 3, 6) and perpendicular to the plane $2x + 6y + 6z = 9$.　$(12\frac{1}{3})$

7.  (a) Find the equation of the line drawn parallel to $\dfrac{x}{2} = \dfrac{y}{3} = \dfrac{z}{4}$ so as to intersect

$9x + y + z + 4 = 0 = 5x + y + 3z$ and $x + 2y - 3z - 3 = 0 = 2x - 5y + 3z + 3$.　**(11)**

(b) Evaluate the length of the shortest distance (SD) and find the equation of the SD between the lines $\dfrac{x-2}{1} = \dfrac{y+3}{2} = \dfrac{z-5}{4}$ and $\dfrac{x-5}{2} = \dfrac{y-2}{3} = \dfrac{z-1}{5}$.　$(12\frac{1}{3})$

8.  (a) Obtain the equations of the tangent planes to the sphere

$x^2 + y^2 + z^2 + 6x - 2z + 1 = 0$ which pass through the line $\dfrac{16-x}{2} = \dfrac{y+15}{3} = \dfrac{z}{2}$.　**(11)**

(b) Derive the condition that the section of $ax^2 + by^2 + cz^2 = 1$ by

$lx + my + nz = p$ should be a circle.　$(12\frac{1}{3})$

**BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA**

L-1/T-1   B. Arch. Examinations 2022-2023

Sub: **HUM 701** (Principles of Economics)

Full Marks: 140                 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) Using the information given in Table 1 calculate Gross Domestic Product (GDP) in Expenditure method and Income method.      **(15)**

**Table 1: Expenditures and Income**

| | |
|---|---|
| Transfer Payments | Tk. 66 |
| Interest Income | Tk. 151 |
| Depreciation | Tk. 39 |
| Wages | Tk. 68 |
| Gross Private Investment (I) | Tk. 125 |
| Business Profits | Tk. 201 |
| Indirect Business Taxes | Tk. 77 |
| Rental Income | Tk. 78 |
| Net Exports (X-M) | Tk. 21 |
| Net Foreign Factor Income | Tk. 15 |
| Government Purchases (G) | Tk. 159 |
| Household Consumption (C) | Tk. 308 |

(b) Calculate GDP in value addition approach considering any arbitrary goods/services.    **(8 $\frac{1}{3}$)**

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

| Quantity of output | TFC | TVC | TC | AC | AVC | AFC | MC |
|---|---|---|---|---|---|---|---|
| 1 | 81 | 31 | | | | | |
| 2 | 81 | | 115 | | | | |
| 3 | | 46 | | | | | |
| 4 | | 56 | | | | | |
| 5 | 81 | 76 | | | | | |
| 6 | 81 | | 181 | | | | |

(b) The Market price in a perfectly competitive market is Tk. 80. A perfectly competitive firm has a marginal cost given by MC = 20Q, where Q stands for quantity produced. Find the profit maximizing output and revenue.    **(8 $\frac{1}{3}$)**

## HUM 701/ARCH

3. A firm producing two goods "X" and "Y" has the profit function

$$Z = 3200X - 100X^2 + 200XY - 200Y^2 + 1600Y - 700$$

   (a) What are the profit-maximizing level of output for each of the two goods? **(15)**

   (b) Test whether profits are maximized. What is the maximized amount of profit? **(8 ⅓)**

4. (a) Either coal (C) or gas (G) can be used in the production of Art paper. The cost of coal is 800 and the cost of gas is 4000. Draw an isocost curve showing the different combinations of gas and coal that can be purchased (i) with an initial expenditure (E) of 80,000, (ii) if expenditures increase by 100 percent, (iii) if the price of gas is reduced by 50 percent. **(15)** Always start from the original equation.

   (b) What are the shutdown conditions of a firm under perfect competition? Show graphically and explain. **(8 ⅓)**

### SECTION – B
There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Define supply function. **(5)**

   (b) What are the factors that influence the shifting of the demand curve? **(10)**

   (c) What are the exceptions to the law of demand? Explain. **(8 ⅓)**

6. (a) Show that price elasticity of demand varies from zero to infinity along any straight line demand curve. Explain graphically. **(13 ⅓)**

   (b) From the following table calculate income elasticity of demand if you move from point B to C and explain what you understand from the result. **(10)**

| POINT | Y | Q |
|-------|------|-----|
| A | 2000 | 200 |
| B | 3000 | 350 |
| C | 4000 | 500 |

(Here 'Y' and 'Q' stand for 'income' and 'quantity' respectively).

# HUM 701/ARCH

7.  (a) How is price determined in an economy under competition? Explain graphically.  **(8 ⅓)**

    (b) From the following demand and supply functions, calculate equilibrium price and quantity and show the result in a graph.  **(15)**

    $$P = 0.30Q + 300$$
    $$P = -0.50Q + 1100$$

    (i) What will happen to the equilibrium price and quantity if government imposes a unit tax of Tk. 100 per unit?

    (ii) Describe the change in equilibrium. Show the equilibrium coordinates on the same graph.

8.  (a) What do you understand by division of labour? Explain different types of division of labour.  **(8 ⅓)**

    (b) What are the advantages and disadvantages of division of labour? Explain.  **(15)**

-----------------------------------------------------