BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Arch. Examinations 2014-2015

Sub : **MATH 111** (Calculus and Solid Geometry)

Full Marks : 140   Time : 3 Hours

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) A function f(x) is defined as follows: **(12)**

$$f(x) = \begin{cases} -x^2 + 1, & x < 0 \\ x, & 0 \le x \le 1 \\ \dfrac{1}{x}, & 1 < x \end{cases}$$

Discuss the continuity and differentiability of f(x) at x = 0 and at x = 1. Also sketch the graph of f(x).

(b) If $y = \cos\{\ln(1+x)^2\}$, then show that   **(11⅓)**

$$(1+x^2)\, y_{n+2} + (2n+1)(1+x)\, y_{n+1} + (n^2+4)\, y_n = 0$$

2. (a) If $u = \tan^{-1}\left(\dfrac{x^2 + y^2 + z^2}{x + y + z}\right)$, then show that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} + z\dfrac{\partial u}{\partial z} = \dfrac{1}{2}\sin u$.   **(8⅓)**

(b) Suppose that $f(x) = x^3 - 3x^2 + 1$. Use first and second derivatives of f(x) to determine the intervals on which f(x) is increasing, decreasing, concave up, concave down and examine for the maximum and minimum of f(x). Locate all inflection points and confirm that your conclusions are consistent with graph.   **(15)**

3. Workout the following (any three):   **(23⅓)**

(a) $\displaystyle \int \frac{dx}{2 + 3\cos x + \sin x}$

(b) $\displaystyle \int (x+2)\sqrt{x^2 + x + 1}\; dx$

(c) $\displaystyle \int \frac{dx}{(1+x)\sqrt{1 + 2x - x^2}}$

(d) $\displaystyle \int \frac{\sqrt{\tan x}}{\sin x \cos x}\; dx$

MATH 111 (ARCH)

4. (a) Evaluate the following: **(6+6)**

(i) $\displaystyle\int_0^{\pi/2} \frac{x \, dx}{\sin x + \cos x}$

(ii) $\displaystyle\int_0^{\pi/4} \sqrt[3]{\tan x} \, dx$

(b) Find the area above the x axis, included between $y^2 = x$ and $x^2 + y^2 = 4x$. **(11⅓)**

SECTION – B

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

5. (a) A line makes angles α, β, γ, δ with the four diagonals of a cube. Prove that **(11)**

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma + \cos^2 \delta = \frac{4}{3}$$

(b) Define the direction cosines of straight line. Find the angle between the two lines whose direction cosines are given by the relations **(12⅓)**

$$l + m - n = 0, \quad nm + 6ln - 12lm = 0$$

6. (a) Show that the lines $\dfrac{x-5}{4} = \dfrac{y-7}{4} = \dfrac{z+3}{-5}$ and $\dfrac{x-8}{7} = \dfrac{y-4}{1} = \dfrac{z-5}{3}$ are coplanar. **(11)**

Find their common point and the equation of the plane in which they lie.

(b) Find the equation of the line of S.D. and length of the S. D. between lines **(12⅓)**

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}; \quad \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$$

7. (a) A plane meets the coordinate axes in A, B, C such that the centroid of the triangle ABC is at the point (p, q, r); show that the equation of the plane is $\dfrac{x}{p} + \dfrac{y}{q} + \dfrac{z}{r} = 3$. **(11)**

(b) Find the equation of the plane passing through the points (1, 2, –2) and (3, –2, 6) and perpendicular to the plane $2x - y - z + 7 = 0$. **(12⅓)**

8. (a) Find the equation of the two spheres which pass through the circle $x^2 + y^2 + z^2 - 4x - y + 3z + 12 = 0$, $2x + 3y - 7z - 10 = 0$ and touch the plane $x - 2y + 2z = 1$. **(11)**

(b) 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 $\dfrac{16-x}{2} = \dfrac{z}{2} = \dfrac{y+15}{3}$. **(12⅓)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Arch. Examinations 2014-2015

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. Describe the effect and use of Texture in the realm of visual art and architecture.   **(20)**

2. Explain Form, time and space as an element of visual art.   **(20)**

3. Discuss 'colour wheel' and the use of colour wheel in visual art.   **(20)**

4. Write short notes on the following   **(15+15=30)**

    (a) Hue, value and intensity

    (b) Primary, secondary and tertiary colour.

SECTION – B

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

5. Describe 'plane' as primary element in architecture.   **(20)**

6. What are the types of Additive form generated due to Additive transformation? Discuss them with sketches.   **(20)**

7. How L-shaped and U-shaped vertical planes define spaces? Explain them with sketches.   **(20)**

8. Write short notes on the following: **(2×15=30)**

    (a) Scale

    (b) Material proportion.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Arch. Examinations 2014-2015

Sub : **PHY 115** (Sound, Light and Heat)

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) Show that the resultant vibration of two simple harmonic vibrations, having equal time period but different amplitude and phase, acting in the same line is also a simple harmonic vibration. **(14)**

    (b) Find the expression of total energy of a simple harmonic oscillator. **(13)**

    (c) A simple harmonic motion is represented by $x = 10 \sin (10t - \pi/6)$ where x is measured in cm, t in seconds and the phase angle in radians. Calculate (i) frequency, (ii) time period, (iii) amplitude and (iv) maximum velocity. **(8)**

2. (a) Derive the differential equation of wave motion. **(7)**

    (b) Show that in the case of stationary waves no energy is transferred. **(16)**

    (c) If two sound waves travel through the same medium, show that the intensity of sound is maximum, where the two waves differ in phase by $n(2\pi)$. Here n = 0, 1, 2, ... etc. **(12)**

3. (a) Define reverberation and reverberation time. In a good auditorium why it is necessary to keep the reverberation time negligibly small and on what factors reverberation time depends. **(12)**

    (b) Show that the intensity of sound waves varies directly as the square of the excess of pressure. **(16)**

    (c) What do you mean by 1 Bel? Calculate the change in intensity level when the intensity of sound increases by 10^5 times its original intensity. **(7)**

4. (a) Explain the term absolute humidity and relative humidity. **(5)**

    (b) Prove that the conduction of heat through a composite blocks is the ratio of temperature difference to the thermal resistance. **(20)**

    (c) The dimension of a wall of a classroom is 7 m by 3.5 m, made of bricks 25 cm thick-lined with plaster 1 cm thick. If has a glass window of area 2.5 m^2 and thickness of 0.5 cm. The temperatures inside and outside of the room are 25°C and 40°C respectively. Calculate the heat conducted per second through (i) the glass and (ii) the plaster lined brick. Given the thermal conductivities of brick, plaster and glass are 1.5×10^{-3}, 1.1×10^{-3} and 2.1×10^{-3} cal cm^{-1} s^{-1} $°C^{-1}$, respectively. **(10)**

PHY 115/ARCH

SECTION – B

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

5. (a) Draw a schematic diagram of hot water supply system of a building. **(5)**

(b) State and proof Kirchhoff's law of radiation. **(20)**

(c) What is solar constant? Calculate the temperature of the moon surface. Given, the distance between earth and moon is 3.84×10^5 km; radius of moon is 1.74×10^6 m; radiation energy incident on earth surface from moon is 0.03 W/m^2 and the Stefan-Boltzmann's constant $\sigma = 5.67 \times 10^{-8}$ Js^{-1} m^{-2} K^{-4}. **(10)**

6. (a) What is Plank's law of radiation? Derive an expression for Plank's law. **(20)**

(b) Deduce Wien's law and Rayleigh-Jeans law from Plank's law of radiation. **(7)**

(c) Consider radiation coming from a perfectly black body filament of temperature 700°C falls on one end of thermo-couple connected with a galvanometer and the deflection recorded was 40 div. If the thermo-couple turned towards another filament of temperature 300°C, calculate the deflection of the galvanometer. **(8)**

7. (a) Can we produce interference with two electric bulbs placed side by side? Explain. **(5)**

(b) Give a diagram showing clearly how coherent sources are produced in Fresnel's biprism method. How can the arrangement be used to determine the wavelength of a given monochromatic source of light? **(20)**

(c) In a biprism experiment, sodium light of wavelength 589 nm is used to get interference fringes and 20 fringes in the interference pattern occupy 2.3×10^{-2} m on the screen. On replacing sodium light by an unknown source, 30 fringes are found to occupy 2.8×10^{-2} m. Find the wavelength of the unknown source. **(10)**

8. (a) What do you mean by diffraction of light? Distinguish between interference and diffraction of light. **(5)**

(b) What is plane polarized light? How would you obtain plane polarized light by reflection? **(20)**

(c) The critical angle of incidence for total reflection in case of water is 48°. What is its polarization angle? What is the angle of reflection corresponding to the polarization angle? **(10)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Arch. Examinations 2014-2015

Sub : **HUM 705** (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 **Q. No. 1**
and any other **TWO** from the rest.

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

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 interest, 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 the interval between them. That is to say, forethought is 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 forethought. In certain communities one man can endure the present pain which another enjoys the future pleasure. The characteristic 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 years later.

Questions:

   (i) What is the essential feature of civilization and why?

   (ii) How is forethought measured in an art?

   (iii) How does industrialism show the sense of collective forethought?

   (iv) How is forethought obtained according to the author?

   (v) What message does the author try to convey through this passage?

   (vi) Give meaning of the following words as used in the passage:

        forethought, brute, epoch, interval, endure

2. (a) Suppose you are the Chief Engineer of a firm. Draft a suitable complaint letter about having received sub-standard and defective goods from your suppliers. (Provide other details from your owns).   **(10)**

   (b) Write phonetic transcriptions of the following words: (Any five)   **(10)**

        about, pleasure, catch, shame, hair, blank

HUM 705/ARCH

3. (a) Write a dialogue between two architects about the impact of high-rise building construction in Dhaka city. **(10)**

   (b) Write a short essay on any <u>one</u> of the following topics: **(10)**

       (i) Nepal Tragedy

       (ii) Our Architectural Heritage

       (iii) Dilemma of a Modern Man

4. (a) Transform the following sentences as directed: (Any five) **(10)**

       (i) Don't get into a bus while it is moving. (Make it Simple)

       (ii) We must eat to live. (Compound)

       (iii) He failed and I was greatly surprised. (Simple)

       (iv) Be diligent, and you will succeed. (Complex)

       (v) The rainbow glimmers and rain disappears. (Complex)

       (vi) By his pleasant manners he gained many friends. (Compound)

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

       (i) The Diphthongs

       (ii) Parts of Paragraph

       (iii) Components of a Formal Report.

SECTION – B

There are **FOUR** questions in this section. Answer **Q. No. 5** and any **TWO** from the rest.

Symbols indicate their usual meaning.

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

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

       (ii) "I am amazed to see you take my poison and suffer no magic change. I am sure you are Odysseus whom nothing defeats."

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

       (i) Make an evaluation of the character of Mrs. Matilda Loisel.

       (ii) What changes came over the life of the lawyer during his fifteen years of imprisonment?

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

       (i) Briefly discuss the terms and conditions of the bet agreed on by the banker and the lawyer.

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

       (iii) Why did Mrs. Forestier fail to recognize her friend?

       (iv) Give a description of the castle of Circe.

HUM 705/ARCH

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

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

    (ii) I was in a dilemma about what to have for dinner.

    (iii) Soup and salad are too light a lunch.

    (iv) Here comes my brother and sister.

    (v) Both of the mouse is underfed.

    (vi) If I were him I should not accept the post.

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

    (viii) I wish I was as tall as my brother.

    (ix) We were late due to the blowout.

    (x) They can't hardly speak English.

    (xi) He had a need and interest in athletics.

    (xii) This box is more square than that one.

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

    Albino, brawl, cryptic, entice, flimsy, homage, moron, pauper, recluse, sinuous, tamper, wrinkle.

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

    Alleviate, blunder, condone, dismantle, forbearance, incisive, loathe, palatable, ratify, simulate, surfeit, vicarious.

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

Instead of blahblahing about the clean healthy rivalry of the football field and the great part played by Olympic Games in bringing the nations together, it is more useful to inquire how and why the modern cult of sport arose. Most of the games we now play are of ancient origin, but sport does not seem to have been taken very seriously between Roman times and the nineteenth century. The games were built into a heavily-financed activity, capable of attracting vast crowds and rousing savage passions, and the infection spread from country to country. It is the most violently combative sports, football and boxing, that have spread the widest. There cannot be much doubt that the whole thing is bound up with the rise of nationalism, that is, with the lunatic modern habits of identifying oneself with large power units and seeing everything in terms of competitive prestige. Also, organized games are more likely to flourish in urban communities where the average human being lives sedentary or at least a confined life, and does not get much opportunity for creative labour. In a rustic community a boy or young man works off a good deal of his surplus energy by walking, swimming, climbing, trees, riding horses, and by various sports involving cruelty to animals, such as fishing cock-fighting and ferreting for rats. In a big town one must indulge in group activities if one wants an outlet for one's physical strength or for one's sadistic impulses.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Arch. Examinations 2014-2015

Sub : **ARCH 131** (Architecture of Ancient Civilization)

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. 1** and any **TWO** from the rest.

1. Write short notes (any two):   **(10×2=20)**

    (a) Shaft Mastaba

    (ii) Barabar Hill Caves

    (iii) Persepolis

2. (a) Compare between the settlements of 'Khirokitia' and 'Catal Hüyük' with necessary

    illustrations.   **(15)**

    (b) Briefly describe the importance of 'Brick' as a building material in 'Eridu and Uruk'.   **(10)**

3. (a) Briefly discuss the city and houses of Mohenjo-Daro with necessary sketches.   **(15)**

    (b) What are the similarities between the temple of Queen Hatshepsut and the temple of

    Abu Simbel?   **(10)**

4. (a) Elaborate the city of Babylon with necessary illustrations.   **(15)**

    (b) Briefly describe the religious context of the 'Mahajanapadas' and the type of

    architecture developed in 'Varanasi' as its effect.   **(10)**

SECTION – B

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

5. (a) Describe the Niuheliang ritual center to explain the religious views of the Hongshan

    culture around 3500 BCE.   **(15)**

    (b) Mention the unique architectural features of the megalithic temples of Malta.   **(10)**

6. (a) Mention the classical orders of Greek Architecture and briefly describe the Ionic Order.   **(10)**

    (b) Describe with illustrations – the features of the Parthenon.   **(15)**

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7. (a) Stonehenge underwent several revisions that significantly and purposefully altered its use and meaning – describe briefly. **(10)**

(b) Write in short the architectural features of El Paraiso, Peru, as one of the first civilization of Americas. **(15)**

8. Write short notes on **(10×2=20)**

       (a) Poverty point of Mississippi Cultures

       (b) Etruscan Temple.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Arch. Examinations 2014-2015

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) Define demand 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 them.   **(8 $\frac{1}{3}$)**

2. (a) Show that price elasticity of demand varies from zero to infinity along any straight line demand curve. Explain graphically.   **(13 $\frac{1}{3}$)**

    (b) 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	Px	Qy
A	200	120
B	300	150
C	400	180

3. (a) What is an indifference curve? Explain the properties of an indifference curve.   **(15)**

    (b) Define budget line and budget set.   **(8 $\frac{1}{3}$)**

4. (a) How is price determined in an economy under competition? Explain graphically.   **(8 $\frac{1}{3}$)**

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

    $$P = 0.30\,Q + 100$$
    $$P = -0.50\,Q + 180$$

    (i) What will happen to the equilibrium price and quantity if the government imposes a unit tax of Tk. 10 per unit?

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

HUM 701/ARCH

SECTION – B

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

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

   (b) Graphically explain the short run equilibrium of a firm under perfect competition. **(13 ⅓)**

6. (a) What are the methods of measuring national income? Explain any two of them. **(10)**

   (b) What are the problems of measuring national income in a developing country like Bangladesh? Explain them. **(13 ⅓)**

7. (a) What do you understand by localization of industries? What are the causes of localization of industries? **(13 ⅓)**

   (b) Explain the advantages of localization of industries. **(10)**

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 labour? Explain them. **(15)**