L-1/T-1/ARCH **Date: 09/09/2025**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Arch. Examinations 2024-2025

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 **SEVEN** questions in this section. Answer **Q. 1** and any **FOUR** from the rest.

1. (a) Describe the chronological evolution of Mastaba tombs during the Old Kingdom Dynasties of Egypt, focusing on changes in their internal layout, external form, and construction techniques. Illustrate with relevant examples from different dynasties. **(15 ×2=30)**
   (b) Characterize the salient features of the Ziggurat at Ur, including its function and materials, with necessary illustrations.

2. Interpret how the trade of gypsum plaster, originating in Mesopotamia, influenced ancient construction and architectural development in different regions during 3500 BCE **(10)**

3. Display the key similarities and differences in the astronomical alignments, presumed functions, and characteristics between the megalithic structures of Nabta Playa and Stonehenge. **(10)**

4. Justify the evolution of temple architecture in Eridu and Uruk, explaining the rationales for their gradually increased monumentality and central placement within the urban fabric of the early Mesopotamian cities. **(10)**

5. Explain the geographical and cultural context that influenced the design and organization of the houses at Khirokitia. **(10)**

6. Describe the evolution of the Stepped Pyramid of Djoser (Zoser) from its initial Mastaba form to its final form with illustrations. **(10)**

7. Highlight the salient features of the great bath of Mohenjo Daro with necessary sketches. **(10)**

SECTION – B

There are **FIVE** questions in this section. Answer **Q. 8** and any **THREE** from the rest.

8. Write short notes on any two of the following: **(12.5×2=25)**
   (a) Treasury of Atreus.
   (b) Palace Complex of Ugarit
   (c) Tomb of Zhengzhou Yi

9. How did Etruscan culture reflect both originality and openness to external influences, and in what ways did they contribute to the later development of Roman architecture and religions spaces? **(15)**

10. Briefly describe the emergence of Greek temple using appropriate example. **(15)**

11. "Iron Age affected global economy"- discuss elaborately. **(15)**

12. Compare between Mycenean palace at Pylos and Minoans palace at Knossos. **(15)**

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11-10-25

L1-/T-I/ARCH

Date: 24/08/2025

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-I B. ARCH Examinations 2024-2025

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. Question No. 4 is Compulsory.
Answer any **TWO** from the rest.

1. (a) What are the visual properties of a form? Describe them briefly. **(10)**

   (b) Discuss Anthropometric proportioning system. **(10)**

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

   (b) Describe the characteristics of spaces when defined by an elevated base plane. **(10)**

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

   (b) Describe the spatial relationship between adjacent spaces located side by side. **(10)**

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

   (a) The concept of a 'dot' as a primary element in architecture. [CO4]

   (b) Characteristics of centrally organized spaces. [CO7]

   (c) Scale. [CO8]

SECTION – B

There are **FOUR** questions in this section. Question No. 5 is Compulsory.
Answer any **TWO** from the rest.

5. Write short notes on the followings: **(10×3=30)**

   (a) "Representational" and "Abstract" shape

   (b) "Symmetry" as an ordering principle

   (c) Psychological effects of "Line" in visual art.

   – Use examples where necessary.

6. Explain how artists manipulate "Space" in their artworks to influence viewers' perception. Use relevant examples to support your answer. **(20)**

7. "A sense of unity with variety is ideal" - explain the statement with reference to different ordering principles. **(20)**

8. Describe "Actual" and "Simulated" texture as elements of visual art. Provide examples where necessary. **(20)**

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(7)

L-1/T-I/ARCH **Date: 14/09/2025**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B.ARCH Examinations 2024-2025

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.

1. (a) Define continuity of a function. **(12)**

A function f(x) is defined in the way: $f(x)=\begin{cases} 5x-4 & ; \quad x\le 1 \\ cx^2-dx & ; \quad 1<x<2. \\ 3x+4 & ; \quad x\ge 2 \end{cases}$ Find for which values of c and d the function is continuous everywhere. Also discuss the differentiability of $f(x)$ at $x = 1$.

(b) State and prove Leibnitz's theorem for successive differentiation. **$(11\frac{1}{3})$**

2. (a) If $v=\left(x^2+y^2+z^2\right)^{\frac{m}{2}}$ then find the value of m $(m \neq 0)$ which will make $\frac{\partial^2 v}{dx^2}+\frac{\partial^2 v}{dy^2}+\frac{\partial^2 v}{dz^2}=0.$ **(11)**

(b) An open box with a rectangular base is to be constructed from a rectangular piece of cardboard 16 in. wide and 21 in. long by cutting out a square from each corner and then bending up the sides. Find the size of the corner square which will produce a box having the largest possible volume. **$(12\frac{1}{3})$**

3. (a) Evaluate the followings: **$(13\frac{1}{3})$**

(i) $\int_0^1 \tan^{-1}\sqrt{x}\,dx$

(ii) $\int_0^{\pi} \frac{dx}{3+2\sin x+\cos x}$

(b) Evaluate $\int \frac{x+\sin x}{1+\cos x}dx$ **(10)**

4. (a) Use definite integral to compute: **(11)**

$$\lim_{n\to\infty}\left[\frac{1}{1^3+n^3}+\frac{2^2}{2^3+n^3}+\ldots+\frac{n^2}{n^3+n^3}\right]$$

(b) Find the area of the region enclosed by $y = \sin x$, $y = \cos x$, $x=\frac{\pi}{2}$ and the y-axis. **$(12\frac{1}{3})$**

Contd P/2

MATH 111/ARCH

SECTION – B

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

5. (a) Define direction cosines. Find the direction cosines and angle between two straight lines whose direction cosines l, m, n are connected by the relation $l-5m+3n=0$ and $7l^2 + 5m^2 - 3n^2 = 0$. **(12)**

(b) If the edges of a rectangular parallelepiped are a, b, c, show that the angle between four diagonals are given by $\cos^{-1}\left(\frac{a^2 \pm b^2 \pm c^2}{a^2 + b^2 + c^2}\right)$. **(11 1/3)**

6. (a) Find the equation of the plane which passes through the point (-1, 3, 2) and is perpendicular to each of the two planes $x + 2y + 2z = 5$, $3x + 3y + 2z = 8$. **(12 1/3)**

(b) Find the locus of the point such that the sum of the square of its distance from the planes $x + y + z = 0$, $x - z = 0$ and $x - 2y + z = 0$ is 9. **(11)**

7. (a) Find the distance of the point (1, -2, 3) from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z-3}{-4}$. Find also the co-ordinates of the foot of the perpendicular. **(11)**

(b) Find the length and the equations of the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$. Also find the points where it intersects the lines. **(12 1/3)**

8. (a) Find the equations of the sphere passing through the circle $x^2 + y^2 + z^2 - 6x - 2z + 5 = 0$, $y = 0$ and touching the plane $3x + 4z + 5 = 0$. **(13 1/3)**

(b) Find the equations of the planes through the line $7x + 10y - 30 = 0$, $5y = 3z$ touching the ellipsoid $7x^2 + 5y^2 + 3z^2 = 60$. **(10)**

L-1/T-I/ARCH **Date: 30/08/2025**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-I B.ARCH Examinations 2024-2025

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

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) Differentiate between echo and reverberation. What are some effective ways to reduce reverberation in a auditorium? **(10)**

(b) Obtain an expression for the time period of a physical pendulum. Explain what will be the time period if the pendulum is oscillating about its center of mass? **(15)**

(c) An oscillator consists of a block attached to a spring (k = 400 N/m). At some time t, the position (measured from the system's equilibrium location), velocity, and acceleration of the block are x = 0.1 m. v = 13.6 m/s and a = 123 m/s^2, respectively. Calculate (i) the frequency of oscillation, (ii) the mass of the block, and (iii) the amplitude of the motion. **(10)**

2. (a) Write down the difference between the transverse and longitudinal waves. **(10)**

(b) Consider a damped oscillatory system where both the damping force and the spring force act. What is the general equation of motion for this system, and how do different damping conditions affect the behaviour of the system's oscillations? **(15)**

(c) The balance wheel of an old-fashioned watch oscillates with angular amplitude π rad and period 0.5 s. Find (i) the maximum angular speed of the wheel, (ii) the angular speed at displacement $\pi/2$ rad, and (iii) the magnitude of the angular acceleration at displacement $\pi/4$ rad. **(10)**

3. (a) Establish the relation between phase velocity and group velocity and group velocity for a plane progressive wave. **(10)**

(b) Derive the expression for the mechanical energy of a linear oscillator and show that it remains constant and independent of time. **(15)**

(c) Ocean waves observed by a swimmer have a height of 0.45 m from crest to trough and a wavelength of 1.8 m. If 12 wave pass by in 2 minutes, determine the equation of the wave assuming it follows simple harmonic motion. **(10)**

Contd P/2

PHY 115/ARCH

4. (a) Define luminous intensity and illumination at a point on the surface. Explain the laws of illumination. **(10)**

(b) Explain the formation of interference fringes in reflected and transmitted light from a plane parallel thin film. Hence, derive the conditions for constructive and destructive interference. **(15)**

(c) In Newton's rings experiment, the diameter of the 15^{th} ring was found to be 0.590 cm, and that of the 5^{th} ring was 0.336 cm. If the radius of curvature of the plane convex lens is 100 cm, find the wavelength of the light used. **(10)**

SECTION – B

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

5. (a) Distinguish between interference and diffraction of light. What are Fraunhofer and Fresnel's classes of diffraction? **(10)**

(b) Describe the Fraunhofer diffraction of monochromatic light due to a single slit. Derive the conditions for the positions of minima and maxima in the diffraction pattern and sketch the intensity distribution. **(18)**

(c) In the Fraunhoffer diffraction pattern, due to a narrow slit, a screen is placed 2 m away from the lens to obtain the pattern. If the slit width is 0.2 mm and the first minima lies 5 mm on either side of the central maximum, find the wavelength of light. **(07)**

6. (a) When unpolarized light passes through a polarizer, show that the transmitted intensity is half of the original intensity. **(10)**

(b) Describe the construction of a Nicol prism and show how it can be used as a polarizer and analyzer. **(18)**

(c) Unpolarized light falls on two polarizing sheets placed one on top of the other. Find the angle between the characteristic directions of the sheets if the intensity of the transmitted light is one-third the intensity of the incident beam? **(07)**

7. (a) Define the following terms in the context of heat transfer via condition through a rectangular bar: **(09)**

(i) Thermal resistance,

(ii) Thermal diffusivity, and

(iii) Steady state.

Contd P/3

PHY 115/ARCH

Contd... Q. No. 7

(b) Two blocks A and B, with thermal conductivities K_1 and K_2, respectively, are placed in contact together in series. The exposed face of A is at θ_1 degrees Celsius and the exposed face B is at θ_2 degrees Celsius. If a material were to replace A and B, derive an expression for the equivalent thermal conductivity K of that material, considering same conditions. **(18)**

(c) A bar of length 30 cm and uniform cross-section 5 cm^2 consists of two halves AB of copper and BC of iron welded together at B. The end A is maintained at 200 °C and the end C at 0 °C. The sides of the bar are thermally insulated. Find the rate of flow of heat along the bar when the steady state is reached. Thermal conductivity of copper is 0.9 cal cm^{-1} s^{-1} $°C^{-1}$ and thermal conductivity of iron is 0.12 cal cm^{-1} s^{-1} $°C^{-1}$. **(08)**

8. (a) Briefly explain the working principle of thermopile. How can it be utilized to detect thermal radiation? **(10)**

(b) Explain the ultraviolet catastrophe. In what are you does Planck's law for black body radiation overcome the deficiency in the Rayleigh-Jeans law in the high frequency region? **(20)**

(c) Two large closely spaced concentric spheres (consider both as black body radiators) are maintained at temperatures 200 K and 300 K, respectively. The space between the two spheres is evacuated. Calculate the net rate of energy transfer between the two spheres. $\left[\sigma = 5.67 \times 10^{-8} Wm^{-2} K^{-4}\right]$ **(05)**
