

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 1st Year Special Backlog Examination, 2022

Course No: Math 1125 Course Title: Mathematics - I

Full Marks: 210

Time: 03 Hours

- N.B i) Answer any three questions from each section in separate script  
ii) Figures in the right margin indicate full marks



Section-A

1. a) Discuss the continuity of  $f(x)$  at  $x=2$  and differentiability of  $f(x)$  at  $x=1$ , where 13  
 $f(x) = x$  for  $0 < x < 1$   
 $= 2-x$  for  $1 \leq x < 2$   
 $= 2x - x^2$  for  $x \geq 2$
- b) If  $u = \sin ax + \cos ax$  then show that  $u_n = a^n \{1 + (-1)^n \sin 2ax\}^{\frac{1}{2}}$  10
- c) State Leibnitz's theorem. If  $y = e^{a \sin^{-1} x}$  then 12  
show that  $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + a^2)y_n = 0$
2. a) Find the maximum and minimum values of  $y = 2x^3 - 21x^2 + 36x - 20$  11
- b) If  $u = \log(x^2 + y^2 + z^2)$ , then find  $x \frac{\partial^2 u}{\partial y \partial z} + y \frac{\partial^2 u}{\partial z \partial x} + z \frac{\partial^2 u}{\partial x \partial y}$ . 12
- c) If  $u = F(y-z, z-x, x-y)$  then find the value of  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$ . 12
3. a) Calculate  $\int \frac{dx}{(1+x)\sqrt{1-x^2}}$  12
- b) Calculate  $\int \frac{3x+7}{\sqrt{x^2-2x+8}} dx$  12
- c) Calculate  $\int \frac{dx}{13+3\cos x+4\sin x}$  11
4. a) Evaluate  $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$  11
- b) Evaluate  $\int_0^{\pi/2} \log \sin x dx$  12
- c) Find the area of the asteroid  $x^{2/3} + y^{2/3} = a^{2/3}$  12

Section-B

5. a) Find the cylindrical polar and spherical polar coordinates whose rectangular coordinates are  $(\sqrt{3}, 1, 2\sqrt{3})$ . 09
- b) Find the ratio in which the YZ - plane divides the line joining the points  $(3, 5, -7)$  and  $(-2, 1, 8)$ . Also find the point of division. 09
- c) Define direction cosines and direction ratios of a line. 17  
If the direction cosines of two lines are connected by the relations  $l+m+n=0$  and  $l^2+m^2-n^2=0$ , then find the direction cosines of the two lines. Also, find the angle between the two lines.

6. a) Write the different forms of the equation of a plane. Find the equation of plane through the points (1,0,-1) and (2, 1, 3) and perpendicular to the plane  $2x+y+z=1$  12
- b) Determine the equation of the plane through the line  $3x-4y+5z-10=0=2x+2y-3z-4$  and parallel to the line  $x=2y=3z$ . 11
- c) Test whether the lines  $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$  and  $\frac{x}{1} = \frac{y-7}{-3} = \frac{z+7}{2}$  are coplanar or not. 12  
If they are coplanar, then find the equation of the plane containing them.
7. a) Find the distance of the point (1,1,1) from the point where the line  $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-2}{6}$  cuts the plane  $4x-3y+2z+6=0$  09
- b) Determine the angle between the line  $\frac{x-3}{6} = \frac{y-2}{3} = \frac{z+1}{-2}$  and the plane  $2x+y+2z+5=0$  09
- c) Find the coordinates of the points, where the shortest distance meets the lines  $\frac{x+1}{4} = \frac{y+1}{5} = \frac{z+1}{-1}$  and  $\frac{x+3}{2} = \frac{y+5}{3} = \frac{z+7}{-3}$ . Also find the length and equation of shortest distance. 17
8. a) Find the equation of the line passing through the point (1, -2, -3) and parallel to the line  $2x+3y-3z+2=0=3x-4y+2z-4$ . 12
- b) Find the equation of the tangent planes to the sphere  $x^2 + y^2 + z^2 - 4x + 2y = 4$  which are parallel to the plane  $2x-y+2z=1$  11
- c) Find the equation of the sphere that passes through the circle  $x^2 + y^2 + z^2 - 4x - y + 3z + 12 = 0$ ,  $2x+3y-7z-10=0$  and cuts the sphere  $x^2 + y^2 + z^2 - 2x + 2z - 4 = 0$  orthogonally. 12



Khulna University of Engineering & Technology

Department of Architecture

B. Arch 1<sup>st</sup> Year Special Backlog Examination, 2022

Course No: HUM 1125 Course Title: Communicative English

Full Marks: 210

Time: 03 Hours

- N.B i) Answer any three questions from each section in separate script  
ii) Figures in the right margin indicate full marks



Section-A

1. a) Make sentences on the following structures using the verb given in bracket 14
- i) Subj. + intransitive verb+ adverbial of place. (walk as verb)
  - ii) Subj. + linking verb + adj. complement. (look as verb)
  - iii) Subj. + linking verb + noun complement. (look as verb)
  - iv) Subj. + transitive verb + infinitive as object. (want as verb)
  - v) Subj. + transitive verb + gerund as object. (stop as verb)
  - vi) Subj. + transitive verb + obj. + adj. complement. (declare as verb)
  - vii) Subj. + transitive verb + obj. + obj. (send as verb)
- b) Change the following words as asked in brackets and make sentence with changed forms. 12
- Secure (into noun), Legitimate (into noun), Nervous (into noun),  
Invasion (into verb), Deception (into verb), Store (into noun).
- c) Make a word with each of the following prefixes and suffixes and use them in sentences. 09
- A-----, Be-----, Mal-----, -----age, -----hood, -----ly.
2. a) Transform the following sentences as asked in brackets. 14
- i) Shova, an engineer, works sincerely at office. (Complex)
  - ii) Habiba, who exercises regularly, is healthy. (Simple)
  - iii) That who are punctual inspires us. (Simple)
  - iv) As you behaves well, we like you. (Compound)
  - v) Liza not only works at an office, but also does social welfare. (Simple)
  - vi) Mim is the best buy in this village. (Positive)
  - vii) Mitu is idle, but fortunate at life. (Complex)
- b) Make use of the following words in sentence as asked in brackets. 12
- Above (as adv.), Before (as adv.), Better (as verb), Close (as adv.),  
Except (as verb), Even (as verb)
- c) Write one antonym and one synonym for the words given below and make sentence with the antonyms and synonyms. 09
- Liable, Honest, Pleasant.
3. a) Make 'Wh' question with the underlines words of the following sentences. 14
- i) Shimu met us yesterday.
  - ii) Shilu works at office with a great punctuality.
  - iii) Aziz is five feet and six inches tall.
  - iv) Nuri has been living in this village for five years.
  - v) Shibli ages 45 years.



- vi) The pond is 10 feet deep.
- vii) He drives the car at a speed of 80 Kms.
- b) Complete the following sentences with clauses as asked in brackets. 12
- i) \_\_\_\_\_ is really inspiring. (Noun clause)
- ii) We address Rana \_\_\_\_\_. (Noun clause)
- iii) \_\_\_\_\_, he can't work hard. (Adv. clause of reason)
- iv) \_\_\_\_\_, he can't prosper in life. (Adv. clause of concession)
- v) \_\_\_\_\_, we will not co-operate you. (Adv. clause of time)
- vi) Rakib, \_\_\_\_\_, lives peacefully in this town. (Adj. clause)
- c) Express the following notions and functions in sentence. 09
- i) Apology, ii) Tension, iii) Thanks, iv) Pleasantness, v) Permission  
vi) Hope
4. a) Correct the following sentences. 14
- i) A sunshine is essential for body.
- ii) President is supposed to arrive in Khulna today.
- iii) Shila will go to yours.
- iv) The book cost me fifty money.
- v) This is a nice poetry.
- vi) His circumstance is bad.
- vii) I have read the work of K. Nazrul Islam.
- b) Make sentences using the following Modals as directed. 12
- i) May (to express good wish)
- ii) Could (to express polite request)
- iii) Need (to express unnecessary action)
- iv) Must (to express logical deduction)
- v) Had better (to express preference)
- vi) Be to (to express command)
- c) Make sentence with the following idioms and phrases. 09
- Cut somebody some slack, Get your together, Hit the sack, Let someone off the hook, On the ball, To get bent out of shape.



### Section-B

5. a) Read the passage and answer the questions that follow. 15
- Children should learn to be honest, sincere and open-hearted to their parents. You should have no secrets which you are unwilling to disclose to your parents. If you have done wrong, you should openly confess it and ask that forgiveness which a parent's heart is ready to bestow. If you wish to undertake anything, ask their consent. Never begin anything in the hope that you can conceal your design. If you once try to cheat your parents, you will be led on, from one step to another, to invent falsehood, to practice artifice, till you will become contemptible and hateful. You will soon be detested, and none will trust you. Sincerity in a child makes up for many faults. Of children he is the worst who watches the eyes of his parents, pretends to obey as long as they see him, but as soon as they have turned away, does what they have forbidden.
- Questions:
- i) What should be the conduct of children to their parents?
- ii) What happens to a child who cheats his parents?
- iii) Who is the worst child?
- b) Make a precise of the above passage with a title. 20

6. a) Amplify the idea- "At his best man is the noblest of all animals, separated from law and justice he is the worst." 20
- b) Write a paragraph on KUET Campus. 15
7. a) As the president of the students club, write a memo calling a meeting to discuss about the upcoming study tour. 20
- b) Prepare a C.V. along with application of a job. 15
8. Write a free composition on any one of the followings: 35
- i) The accountability of humans to environment.
  - ii) Your childhood memories.



Khulna University of Engineering & Technology

Department of Architecture

B. Arch 1st Year Special Backlog Examination, 2022

Course No: Phy 1125 Course Title: Physics

Full Marks: 210

Time: 03 Hours

- N.B i) Answer any three questions from each section in separate script.  
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Section-A

1. a) What is simple harmonic motion? Show that simple harmonic motion is an oscillatory motion in terms of its displacement, velocity and acceleration. 12
- b) Show that energy of a plane progressive wave is given by  $E=2\pi^2\rho\gamma^2a^2$ ; where the symbols have their usual meanings. 13
- c) A particle executes S.H.M given by the equation  $y= 10\sin (10t + \phi)$ . If the time period is 25 seconds and the particle has a displacement of 10 cm at  $t = 0$ , Find, 10
  - (i) Epoch,
  - (ii) Phase angle at  $t = 5$  sec, and
  - (iii) The phase difference between two positions of the particle 10 seconds apart.
2. a) Explain analytically the formation of stationary waves. How can you indicate the position of nodes and antinodes? 12
- b) Show that there is no transfer of energy across any section of the medium in case of stationary wave. 13
- c) Two trains travelling in opposite directions at 70 km/hr each, cross each other while one of them is whistling. If the frequency of the note is 500 Hz, find the apparent pitch as heard by an observer in the other train: (i) before trains cross each other, and (ii) after the trains have crossed each other. Velocity of sound in air is 332 m/s. 10
3. a) What is Weber-Fetchner law? Discuss the different factors on which loudness depends. 12
- b) Define the intensity and energy density at a point in a plane wave of sound. Obtain an expression for the intensity of a plane wave in terms of acoustic pressure level. 13
- c) A musical instrument of frequency 550 is sending out waves of amplitude  $10^{-3}$  cm. Find, 10
  - (i) Energy of waves/ $m^3$ , and
  - (ii) Intensity of sound in Joules/second/ $m^2$ .Given the velocity of sound as 332 m/s and density of air is  $1.29 \text{ kg}/m^3$ .
4. a) How can you detect an ultrasonic wave? Mention at least ten applications of ultrasonic waves. 12
- b) What are the acoustic requirements for a good auditorium? What factors need to be addressed for designing a Hall? 13
- c) A room dimensions are  $12 \times 8 \times 10 \text{ m}^3$ . Calculate, 10
  - (i) The mean free path of the sound wave in the room,
  - (ii) The number of reflections made per second by the sound wave with the walls of the room. (Velocity of sound in air is 332 m/s)

Section-B

5. a) What are the common defects in the images produced by a single lens? How can these defects be removed? 12



- b) Explain what is meant by chromatic aberration in lenses. Explain how chromatic aberration may be removed in the case of a combination of two lenses in contact. 13
- c) It is desired to make a converging achromatic lens of mean focal length 30 cm by using two lenses of materials A and B. If the dispersive powers of A and B are in the ratio of 1:2, find the focal length of each lens. 10
6. a) Show that the light waves are transverse waves and not longitudinal waves. 10
- b) Discuss the construction details and working principles of a Nicol prism. How can it be used as a polarizer and an analyzer? 15
- c) A 20 cm long tube containing sugar solution rotates the plane of polarization by  $12^\circ$ . If the specific rotation of sugar is  $66^\circ$ , calculate the strength of the solution. 10
7. a) What is primary color and secondary color? Draw a color triangle to explain that how white color formed. 13
- b) Discuss additive color mixing and subtractive color mixing with diagram. 12
- c) Explain the axioms of color matching. 10
8. a) What is photometry? Deduce Inverse Square law. 10
- b) What is meant by luminous flux? State and prove the Lambert Cosine Law. 15
- c) Using the Beer-Lambert law, find the molar extinction co-efficient for a species that absorbs 0.561 a.u. at  $\lambda_{\max}$  of 534.0 nm. The path length of cuvette is 100 cm, and the concentration of the solution is  $1.5 \times 10^{-5}$  M. 10

