Sylhet Engineering College, Sylhet

(Shahjalal University of Science & Technology)

Department of Civil Engineering

Final Examination, 2024 — **1st Year 1st Semester**

Course No.: MAT 0541 1103 — **Course Title: Differential Calculus, Integral Calculus and Matrices**

Time: 03 (Three) hours — **Full Marks: 60**

N.B. : (i) Answer all questions from each PART (ii) Use separate answer scripts for each PART

(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)----------N/A----------

PART- A

1. **(a)** Define absolute value function with example and graph. **3**

(b) If a function f(x) = $\begin{cases} 2x-1, when\ 0 < x \le 1 \\ x^2 - x + 1, when\ x > 1 \end{cases}$

Then check continuity and differentiability at the point x = 1. **2+2**

(c) Find nth derivative of the function y = ln(1-2x). **3**

OR

1. **(a)** If $lny = tan^{-1}x$ then show that $(1+x^2)y_{n+2} + (2nx + 2x - 1)y_{n+1} + n(n+1)y = 0$ **5**

(b) Evaluate i) $\int \frac{dx}{(x+1)\sqrt{x^2+2x}}$ ii) $\int \frac{dx}{4+5\sin x}$ **5**

2. **(a)** Evaluate using L'Hospital law : $\lim_{x\to 0}[\frac{4}{x^2-4} - \frac{1}{x-2}]$ **4**

(b) If u = $\ln(x^2 + y^2)$ then show that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ **3**

(c) If u = $tan^{-1}\frac{x^3+y^3}{x^2+y^2}$ Then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{sin2u}{2}$ **3**

3. **(a)** Find tangent and Normal line of the curve y(2x-3)=3x-2 at the point (4,2) **5**

(b) Find minimum value and maximum value of the function $5x^6 - 18x^5 + 15x^4 - 10$. **5**

PART- B

4. **(a)** Evaluate : (i) $\int \frac{(x^2+1)dx}{(2x+1)(x-1)(x+1)}$ (ii) $\int e^{ax}x^3\,dx$ **2+3**

(b) Find a reduction formula for $\int sin^n x dx$ and hence find the value of $\int_0^{\frac{\pi}{6}} sin^4 3x\,dx$ **2+3**

OR

4. **(a)** Prove that $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$ **3**

(b) $Evaluate$: $\int_0^{\frac{\pi}{2}} \ln(tanx + cotx)\,dx$ **4**

(c) Prove that $\left[(\frac{1}{2}) = \sqrt{\pi}\right.$ **3**

5. **(a)** Evaluate : $\int_0^{\infty} \frac{xdx}{(1+x)(1+x^2)}$ **2**

(b) Find the area enclosed by the parabolas $y^2 = 2x$ and the straight line y = $3x$. **4**

(c) Evaluate: $\iiint_G\ xyz\,dv$, where G is the solid in the first octant is bounded by the parabolic cylinder z = 2-x^2 and the planes z = 0, y = x, y = 0. **4**

6. **(a)** Give two graphical representation of system of linear equation where the system has no solution and unique solution. **2**

(b) Solve the following system of linear equations : **4**

x+2y-3z = -1
5x+3y-4z = 2
3x-y+2z = 7

(c) Given the vectors (2,1,1), (1,3,2), (1,3,-1) and (1,-2,3).Test whether they are linearly independent or dependent . **4**

Sylhet Engineering College, Sylhet
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Department of Civil Engineering
1st year 1st Semester Final Examination 2024
Course Code: CHE 0531 1101, Session: 2023-24
Course Title: Chemistry I

Full Marks: 60 Credit: 2.0 Exam Duration: 2 Hours
Answer all questions from each part

Part A

1. a) Derive de-Broglie's equation for a particle of mass m and moving with a velocity of v. 4

b) What is electronegativity? How it changes in a periodic table? 1+4

c) Be and N in the 2nd period and Mg and P in the 3rd period of the periodic table have slightly higher ionization energies than expected – Explain. 4

d) Calculate the emission wavelength (in nanometers) of the line in the Bracket series, where an electron drops down from 6th orbit. ($R_H = 1.097 \times 10^7\ m^{-1}$) 2

2. a) State Raoult's law of lowering of vapour pressure and give its derivation. 5

b) What is solubility curve? Show the solubility of $NaNO_3$, KNO_3, KCl, $CaCl_2$, Na_2SO_4 in water at different temperature by solubility curve. 1+5

c) How is normality related to molarity? 5 g of NaCl is dissolved in 1000 g of water. If the density of the resulting solution is 0.997 g per ml calculate the molarity and normality assuming volume of the solution is equal to that of solvent. 2+2

OR

a) Define a covalent bond with example. What are the factors favoring covalent bond formation? 2+4

b) Which is more stronger between sigma and pi bond and why? 1+3

c) Draw molecular orbital configuration of C_2 molecule and find out bond order and magnetic properties of C_2 molecule. 3+2

Part B

3. a) Define acid and base with example by Bronsted -Lowry concept. Show that water can act both as an acid and a base. 3+3

b) How do you calculate the pH of an acid buffer? 5

c) Define chemical equilibrium. 1 mole of HI is heated in a closed container of capacity of 2L. At equilibrium half a mole of HI is dissociated. Calculate the equilibrium constant of the reaction. 1+3

4. a) State and explain Hess's law of constant heat summation. 5

b) What is electrolysis? Explain electrolysis of molten NaCl. 1+4

c) Differentiate between electrochemical and electrolytic cell. 5

OR

a) Discuss the hydration chemistry of white cement vs ordinary portland cement. 5

b) Define cement. How can hard water affect cement setting and strength? 1+4

c) Differentiate between wet and dry process of manufacturing of portland cement. 5

Sylhet Engineering College, Sylhet
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1st Year 1st Semester | **Final Examination, 2024**
Course No.: PHY 0533 1103 | **Course Title: Physics I**
Time: 03 (Three) hours | **Full Marks: 60**

N.B. : (i) Answer all questions from each PART (ii) Use separate answer scripts for each PART
(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)----------N/A-----

PART- A

1. **(a)** State and prove Maxwell's law of equipartition of energy. **4.5**
   (b) Write the conditions of reversibility for any heat engine. **2.5**
   (c) An inventor claims to have developed an engine working between 600K and 300K capable of having an efficiency of 52%. Comment on his claim. **03**

   OR

1. **(a)** What is Seebeck effect? Explain this effect with figure. **3.5**
   (b) Write down the statement of 0^{th} law of thermodynamics. **02**
   (c) What do you mean by efficiency of a heat engine? The efficiency of a Carnot engine is 1/6. If on reducing the temperature of the sink by 65^0C, the efficiency becomes 1/3. Find the Temperature of the source and the sink between the engines is working. **4.5**

2. **(a)** Explain the following terms- **03**
   i) Phase Velocity
   ii) Group Velocity
   (b) Derive the differential equation of simple harmonic motion. **3.5**
   (c) The velocity of a simple harmonic wave is 30 cm/s. At a time, t=0, the displacement of a particle is given by $\boldsymbol{4sin\ 2\pi(\frac{X}{100})}$. Find the equation for the displacement at a time t=2 sec. **3.5**

3. **(a)** What do you mean by polarization of light **02**
   (b) Why the center of Newton's ring is dark? Explain with figure. **04**
   (c) The diameter of a tenth dark ring in a newtons ring system viewed normally by reflected light of wavelength 5900 AU is 5 mm. Calculate radius of curvature of the lens and the thickness of air film. **04**

PART- B

4. **(a)** From theory of interference (with figure), prove that the distance X, between two successive bright or dark fringes is given by $\boldsymbol{X = \frac{D\lambda}{d}}$ **06**
   (b) A light of wavelength 5100 A^0 from a narrow slit is incident on a double slit. If overall separation of 5 fringes on a screen 100cm away is 2cm. Calculate the slit separation. **04**

   OR

4. **(a)** How Huygens explain the propagation of light? **03**
   (b) What is wavefront? Discuss reflection of plane wavefront at a plane surface. **04**
   (c) Two wave of same wavelength 5890 A^o and same phase difference overlap with each other to create interference. Calculate the path difference for constructive and destructive interference .note that these waves start in phase with each other. **03**

7. **(a)** Apply 1st law of thermodynamics to explain following situations: **05**
   i) Heat supplied to the system converted into increase in internal energy work done by the system.
   ii) Heat supplied to the system entirely converted into work done by the system.
   (b) Write two statements of 2nd law of thermodynamics. **2.5**
   (c) Explain the types of equilibrium in thermodynamic system. **2.5**

8. **(a)** What is resonance? **1.5**
   (b) What is damped oscillation? Explain it with figure. **3.5**
   (c) Write the characteristics of simple harmonic motion. **2.5**
   (d) Distinguish between longitudinal and transverse wave. **2.5**

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Final Examination, 2024 — **1st Year 1st Semester**
Course No.: HUM 0231 1101 — **Course Title: English-I**
Time: 02 (Three) hours — **Full Marks: 60**

N.B. : (i) Answer all question from each PART (ii) Use separate answer scripts for each PART
(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)----------N/A-

PART- A

1. **(a) Identify the part of speech of the underlined word:** **5**
   i. He spoke to me in a very **kind** manner.
   ii. She arrived early and sat **beside** her friend.
   iii. The police found the **missing** child in the park.
   iv. He could not run **fast** enough to catch the bus.
   v. **What** you said really surprised everyone.

   (b) Change the following Active voice into Passive: **5**
   i) All his pupils like him.
   ii) Always speak the truth.
   iii) Who thought you English?
   iv) We made him captain.
   v) Panic seized the writer.

   (c) Change the sentences as directed: **5**
   i) He said, "I met her long ago". (Indirect)
   ii) Karim said to me "Did you take the examination." (Indirect)
   iii) He said, "We all are sinners". (Indirect)
   iv) He said to me, "let me come in" (Indirect)
   v) My mother said, "May God bless you." (Indirect)

2. Write a paragraph on **'Global War'**. **15**

   OR

   What is report? Make a report on **'Inhuman Attack upon People in Palestine'.** **15**

PART- B

3. Correct the following sentences. $10 \times 1.5 = 15$ **15**

   a) Irrespective of the fact that climate change does not alter our day to day activities, **their effects are undoubtedly affecting the ecosystem**.
   b) The formula for cracking competitive exams is not applying shortcuts **but going by full-fledged strategy**.
   c) I **returned back** from Medina.
   d) They were **with daggers** drawn despite attempts to understand each other.
   e) Though very old, yet my grandfather is the **complete** head of the extended family.
   f) People in villages do not have enough water, **besides** many people in metro cities have water even for their swimming pools.
   g) Let's **eat grandpa**.
   h) Students who **study rarely** get bad grades.
   i) What **kind of a car** do you want?
   j) The growth of the railroads led to the abolition of local times, **which was determined by when the sun reached the observer's meridian and differing** from city to city, and to the establishment of regional times.

4. Make your own **CV** in any international format to apply for a job. **15**

   OR

   Write a short essay on **'Solar Energy'**. **15**

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1st Year 1st Semester **Final Examination, 2024**
Course Code: HUM 0311 1100 **Course Title: History of the Emergence of Independent Bangladesh**
Time: 3 (Three) Hours **Full Marks: 60**

N.B.: (i) Answer all questions from each PART *(ii) Use separate answer scripts for Each Part*
(iii) Marks allotted are indicated in the margin *(iv) Special Instruction (if any) -----N/A -------*

PART-A

1. What is lahore resolution? Why it is significant in the history of Bangladesh? **10**

2. Describe the background and Importance of our language movement in 1952. **10**

3. What is military rule? Describe its merits and demerits? **10**

OR

Do you think, military rule is any conflicting to democratic rule?

PART-B

4. How the mass-uprising in 1969 forced to achieve the independence of Bangladesh? **10**

5. What do you know about the national election in 1970 and why it is important in the history of Bangladesh? **10**

6. Describe the political affairs of Bangladesh just after the war of liberation of Bangladesh in 1971. **10**

OR

What was the termoil in politics just after the war of our liberation in 1971?

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1st Year 1st Semester | **Final Examination, 2024**
Course Code: HUM 0317 1103 | **Course Title: Sociology**
Time: 2 (Two) Hours | **Full Marks: 60**

N.B.: (i) Answer two questions from each PART (ii) Use separate answer scripts for Each Part
(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any) -----N/A -------

PART-A

1. **a)** What is sociology? Discuss the three major sociological perspectives with examples. **09**
b) Write the relevance of sociology in the field of civil engineering. **06**

Or **a)** What is social structure? Describe the social structure of Bangladesh. **09**
b) Compare the characteristics of Eastern (Oriental) and Western (Occidental) societies. **06**

2. **a)** Provide a critical overview of the Malthusian thesis on population growth. **06**
b) Describe the stages of demographic transition theory. In which stage of demographic transition is Bangladesh currently situated and why? Provide your own arguments. **09**

PART-B

3. **a)** What is social evolution? Explain Herbert Spencer's theory of social evolution. **09**
b) How do changing techniques of production influence the process of social evolution? **06**

Or **a)** Define culture and civilization. What are the basic elements of culture? **07**
b) Compare and contrast culture and civilization with appropriate examples. **08**

4. Write short notes on the following concepts (with examples):
a) Community **05**
b) Association **05**
c) Institution **05**

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Final Examination 2024 — **1st year 1st Semester**
Course No: CE 0731 1121 — **Course Title: Surveying**
Time : 3 (Three) hours — **Full Marks : 60**

N.B. (i) Answer all questions from each part (ii) Use separate answer script for each part
(iii) Marks allotted indicated in the margin (iv) Special Instruction (if any).....N/A..

Part- A

1. a) What is closing error? How can this error be corrected? **(3)**

b) What is chain surveying? Mention features of different kinds of chains used in chain surveying. **(3)**

c) Describe the steps of chain surveying. **(4)**

2. a) What are the characteristics of contour lines? **(3)**

b) Show with net sketches the characteristics feature of contour line of the following: **(2)**
Pond; II) a hill; III) a ridge IV) a valley

c) The following perpendicular offsets were taken from a chain line to a hedge: **(5)**

Distance (m)	0	5	10	15	20	30	40	50	65	80
Offset (m)	3.40	4.25	2.60	3.70	2.90	1.80	3.20	4.50	3.70	2.80

Calculate the areas by i) Trapezoidal rule and ii) Simpson's rule

3. In a leveling operation two station A, B are taken and the staff reading 5.42, 7.24, 6.46, 5.38, 6.55 and 6.92 are successively from station A where 5.42 is the back reading and R.L of the point is 100. From position B, the staff reading are 8.78, 8.52, 6.24, 5.96, 6.35 and 7.54 where 8.78 is back reading. Calculate the reduced level of each point either by Rise and Fall method or Height of Instrument Method. Also apply necessary checks. **(10)**

OR

a) Define Tacheometry. Derive the equation for measuring distance in horizontal sight using taheometry. **(5)**

b) A techeometer was set up at a station S and the readings on a stadia rod held upon a bench mark A whose R.L. is 110.00 were 3.22, 4.82, and 6.42 and the vertical angle was 4°12'. Again the stadia readings at a station B were 2.00, 4.12 and 6.24 and the angle of depression was 7°36'. Calculate the horizontal distance between A and B and the R.L. of the station B. Take f/I =100 and f+d = 1 **(5)**

Part -B

4. a) Write the instument used with their functions in plane table surveying. **(3)**

b) Describe the working operations in plane table surveying **(3)**

c) Define photogrammetry. Write down the purpose of aerial photography. Classify aerial photography with characteristics. **(4)**

5. a) What is surveying? What are its importance **(2)**

b) A coastal embankment at a constant reduced level of 60.00 is to be constructed. The transverse ground is leveled. The following are the levels of the ground surface along the alignment at 50ft. interval. The width of the formation level is 20 ft with a side slope of 2:1. **(6)**

Chainage (ft)	0	50	100	150	200	250	300	350	400
Surface Level	58..	56	54	50	48	52	57	58	54

Calculate the amount of earth work to construct the proposed coastal embankment.

c) What are differint types of lines that are used in chain surveying? Write their functions. **(2)**

6. a) What is chain surveying? What are errors and mistakes that may arise in chain surveying? **(3)**

b) A steel tape 20m long standardized at 55°F with a pull of 10Kg was used for measuring a base line. Find the correction per tape length, if the temperature at that time of measurement was 80°F and the pull exerted was 16Kg. Weight of 1 cubic cm of steel = 7.86 gm. Weight of tape = 0.8Kg and E = 2.109×10^6 Kg/m^2. Co-efficient of expansion of tape per 1°F is 6.25×10^{-6} . **(5)**

c) What are the different types of correction applied in chain surveying **(2)**

OR

a) What is traverse surveying? When is it done? **(2)**

b) What is vertical curves? What are its types? Describe them. **(3)**

c) Calculate the necessary data to set out a 5° curve by one theodolite between two straight roads intersecting at an angle of 160°. The chainage at the point of intersection is 3540 ft. **(5)**