Subject: Communication English (SH 204)

Candidates must give their answers in their own words as far as practicable.

Attempt ALL questions.

1. Answer ANY ONE of the following questions. [5 × 1 = 5]
   a. Describe the nature of technical communication.
   b. Define paraphrasing plagiarism and patchwork plagiarism.
2. Answer ANY TWO the following questions (Question no. 'c' is compulsory) [2 × 5 = 10]
   a. Write bias-free words of the following words:

      foreman, delivery boy, repairman, serviceman, corporate wife, middleman, freshman, forefathers, fatherland, rise of man
   b. Describe the roles of unity and coherence in effective technical writing.
   c. Rewrite the following sentences with correct answers:
      i. There (seem) to be three deer hiding in the bush.
      ii. Shanti's dog who is my neighbour has gone mad. (Edit the sentence)
      iii. The poet sat in this tower and gazed on the sea. (Change into a simple sentence)
      iv. Notwithstanding several efforts, he failed. (Change into a compound sentence)
      v. You have earned his gratitude, so you shall not go unrewarded. (Change into a complex sentence.)
      vi. Nothing but cats and dogs (be) seen there yesterday.
      vii. He was the most eloquent speaker.....I ever heard. (Use pronoun.)
      viii. With a view to (help) him, she came early.
      ix. Rather than (go) out, she started doing her homework.
3. Answer the following questions: (Question number 'a' and 'b' are compulsory)

   [7 + 7 + 6 = 20]

   a. Write a report on "Controlling Sound Pollution in Kathmandu". Mention only the main section of your report. [7]
   b. A large public limited company has been spending about rupees seven lakhs per annum on getting its various documents such as routine forms, brochures, reports, proposals, manuals, etc, printed by outside agencies. For greater economy and efficiency it has decided to have its own Publishing Unit to cater to all its printing needs. As Office Manager write a proposal for the creation of this unit for consideration of the Board of Directors. Prepare title page, abstract, and cost estimate parts of the proposal. [7]
   c. Write abstract and introduction sections of a research article entitled "The Impact of climate change on coastal cities and potential adaptation measures". [6]

   OR

   Prepare a reference page of the given information into APA style of citation:

   a. Name of authors: B.B. Karki

      Name of journal: Journal of Nepalese Business Studies

      Title of article: Doing Business and Role of Government for Entrepreneurship Development

      Volume and issue numbers: 7(1)

Year of publication: 2010

Page numbers: 53-62

b. Name of authors: Meenakshi Raman and Sangeeta Sharma

Name of book: Technical Communication: Principles and Practice

Year of publication: 2022

Edition: 4th

Place of publication: New Delhi

Name of publisher: Oxford University Press

4. Answer ANY TWO of the following questions. [2 × 5 = 10]

a. You have a degree of Bachelor in Computer Engineering. Now you want to get admission in Master of Computer Engineering in one of the best universities of America. Inventing details write a letter asking for necessary information.

OR

Inventing all the necessary details, draft a notice with a four-point agenda for the tenth meeting of a local youth club regarding establishment of library for the locality.

b. Write a memo to your staff in your company Nepal Apple Incorporation, informing them that, an international acclaimed motivational speaker, Shiv Khera would be conducting a session in the company that you work. The venue of the session would be in the company hall, from 9 AM to 4 PM on 28th of January 2025, with a half hour break in between as that would be decided by key speaker. Please inform that the Company Executive Officer (CEO) will also be taking part in the meeting as a participant.

c. Your college is organizing a one-day workshop on "Agricultural Entrepreneurship and Youth Employment". Write a press release inviting local media to cover the event.

OR

Write a letter of complaint to the organizer of a conference you recently participated in. The conference organizers claimed that over 10,000 people would attend but only around 500 people visited. Explain your disappointment and suggest ways for them to make amendments.

5. Answer the following questions. [2 × 5 = 10]

a. List the fundamentals of effective speaking. Discuss the role of pace in effective speaking.

b. How can you overcome fear and nervousness of public speaking?

6. Answer ANY ONE of the following questions. [1 × 5 = 5]

a. Create a bar graph to show the work schedule of any proposed work.

b. Bring out the differences between the following:

i. Chart and table

ii. Chart and graph

The End

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING

Examination Control Division

2081

Examination	**Regular ☐**	**Back ☐**	
Level	**BAR**	**Full Marks**	**60**
Program	**BAR**	**Pass Marks**	**24**
Year /Part	**II/I**	**Time**	**3 hrs**

Subject: - Building Materials II **Course Code: - ENAR 203**

Candidates are required to give their answers in their own words as far as practicable.
Attempt **All** questions.
The figures in the margin indicate **Full Marks.**
Sketches are highly encouraged.

Q. N.	Description	Marks	Chapter No.
1.a)	Describe the structure of an exogenous tree. Explain any two methods, each of artificial and natural seasoning of timber.	[2+4]	2
1.b)	Describe the various methods of sawing for conversion of timber.	[6]	2
2.a)	Define ferrous and non-ferrous metals. Elaborate any three ferrous metals, with their properties and uses.	[2+4]	3
2.b)	Explain the various processes of heat treatment of steel.	[6]	3
3.a)	Define paint and its constituents. Explain the process of painting on cement plastered surfaces.	[3+3]	4
3.b)	Define varnish. Explain the process of varnishing on wood work.	[2+4]	4
4.a)	Define sound insulation. Explain any three types of sound insulating materials.	[2+4]	5
4.b)	Explain the significance of finishing materials. Explain any two types of wall finishing materials and their applications.	[2+4]	7
5)	Write short notes on **ANY THREE**: a. Energy- Efficient Materials b. Ferro-Cement c. Fire-Resistant Construction d. Cement Plaster	[3x4]	6, 8, 9

Subject: Design Theory –I (ENAR 204) Sample Question

- ✓ *Attempt **All** questions.*

Q. No.	Questions	Marks	Units
1	a. Differentiate between normative and positive theory in architecture. b. Describe a modern building by applying Vitruvian triad.	6+6	1, 2
2	a. Explain Modernism and Post Modernism in architecture. b. What socio- cultural factors would you consider when designing a residence in an extremely cold climate, such as in Mustang?	6+6	3
3	a. Taking an example of vernacular architecture, demonstrate the integration of form, function and context building with sketches from appropriate example. b. Define Proxemics. Differentiate four proxemics spatial zones with practical examples.	6 2+4	4 5
4	**Comprehension and analysis** Read the following situation carefully and answer the questions given. *"You are tasked with designing a community center in an urban neighborhood. The site is located in a densely populated area with limited open space and high pedestrian traffic. The design must integrate green spaces, promote sustainability, and cater to the social and recreational needs of the community."* a) How would you conduct a site analysis for this community center, considering factors like limited open space and high pedestrian traffic? b) What design strategies would you use to integrate green spaces and promote sustainability in the community center? c) Provide sketches from your design project to illustrate how you addressed the challenges and incorporated solutions in your final design.	4+4+4	6
5	Write short notes on (specify words): a. Vastu Shastra b. Building task c. Wicked and ill-defined problems d. Lefebvre's triad	4x3	2, 4, 5, 6

SAMPLE FINAL EXAM QUESTION FOR BUILDING SCIENCE I (AR205)

ATTEMPT ALL QUESTIONS

1. a) Explain the geometry of solar movement with neat sketches. Explain the factors affecting climate of a place? (3+3 marks) (ch. 2)

   b) Difference between micro climate and macro climate? Explain the types of climates found in Nepal. (3+3 marks) (ch. 2)

2. a) It is required to cover a window of 1.35 m. high against direct sunlight by a horizontal louver fixed 100 mm. above the upper edge of the window. What should be the effective projection of the louver in front of the wall? The wall is facing South. The full coverage is to be obtained at 10.00 A.M. on 23 July in Dharan, Nepal. Draw neat diagrams for the calculation. (6 marks) (ch. 2)

   b) Explain about internal comfort. Explain how internal comfort can be attained by human being? (6 marks) (ch. 7)

3. a) Explain the thermal control techniques for warm humid climate with neat and clean sketches? (6 marks) (ch. 3)

   b) Find out the U-value of the composite wall section assuming the following respectively from exterior to interior:

i. External surface resistance, $1/f_o$ = 0.076 m°C/W
ii. Conductivity of brick work 110 mm thick, K = 1.15 W/m°C
iii. Air cavity resistance 50mm thick, R = 0.176 m^2°C/W
iv. Conductivity of wood wool 25 mm thick, K = 0.093 W/m°C
v. Conductivity of gypsum plaster 12mm thick, K = 0.461 W/m°C
vii. Internal surface resistance, $1/f_i$ = 0.123 m°C/W

   Draw the typical section of the composite wall. Calculate the rate of heat flow through the wall if the wall is 3m. high and 4m long. The temperature of inside wall is 22°C and outside is 36°C. (4+2 marks) (ch. 3)

4. a) What are the characteristics of cold climate? If you are designing a building for this region, what are the considerations would you take for design of a particular building? (6 marks) (ch. 4)

   b) How important are local bye-law for application in building from lighting, acoustic and thermal perspective? (6 marks) (ch. 5)

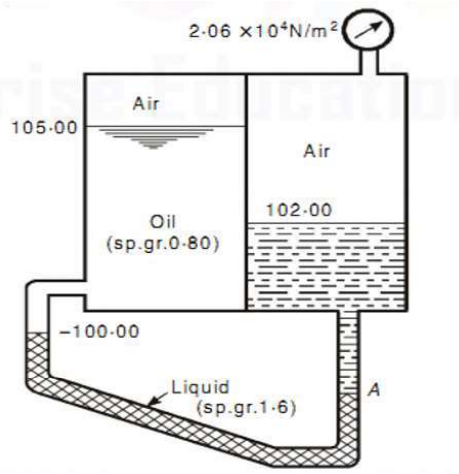
5. Write short notes on any two: (6 x 2 = 12) (ch.3 and 6)
   a) Thermal balance in a human body.
   b) Prevention of condensation
   c) Wind rose
   d) Thermal Insulation

SAMPLE FINAL EXAM QUESTIONS

- **Attempt All questions**

1. a) Define Streamline, Path line and streak line with governing equations. Derive an expression for continuity equation in cartesian coordinate system. (3+3)

   b) In the tank as shown in figure below, the air pressure is -0.23 m of mercury. Determine the elevation of the gage liquid in the right-hand column at A, if the liquid in the right-hand tank is water. (6)



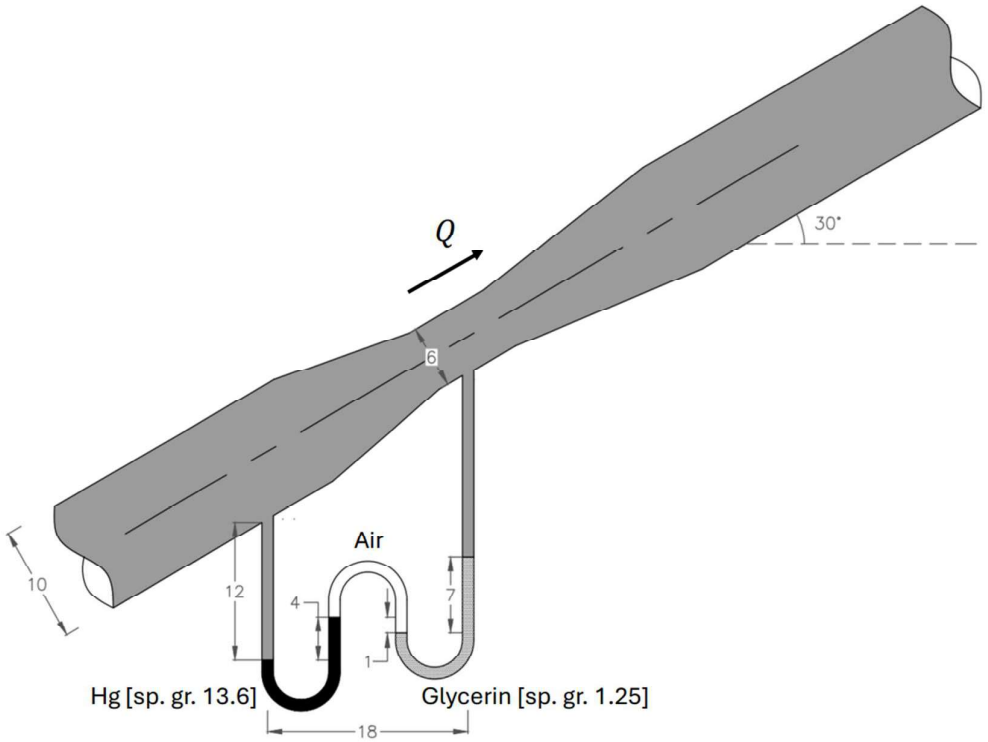
2. a) Derive Euler's equation of motion in a fluid flow. Explain the concept of stability of submerged body in the fluid. (3+3)

   b) An open cylindrical tank 1.2 m high and 0.6 m in diameter is filled 2/3rd with water when at rest. It is spun about its vertical axis with angular velocity ω radians per second, and the free liquid surface in the tank assumes the shape of paraboloid of revolution. Determine the speed of rotation when:

   i) The water just starts spilling over the sides of the tank.

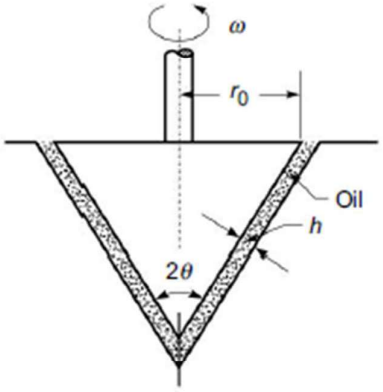
   ii) The point at the centre of the base is just exposed. What would then be the percentage of water left in the tank? (3+3)

3. a) A venturi meter having the throat diameter 6 cm is used to determine the water discharge flowing through an inclined pipe of diameter 10 cm. If the manometer composed of mercury, glycerin and air in between them shows the reading as shown in figure below, determine the discharge in the pipe. [All given dimensions are in cm.] (6)



b) A flat plate 2m x 2m moves at 60 km per hour in stationary air of density 1.15 kg/m3. If the coefficient of drag and lift are 0.15 and 0.75 respectively. Determine Lift force, drag force, resultant force and power required to keep plate in motion. [6]

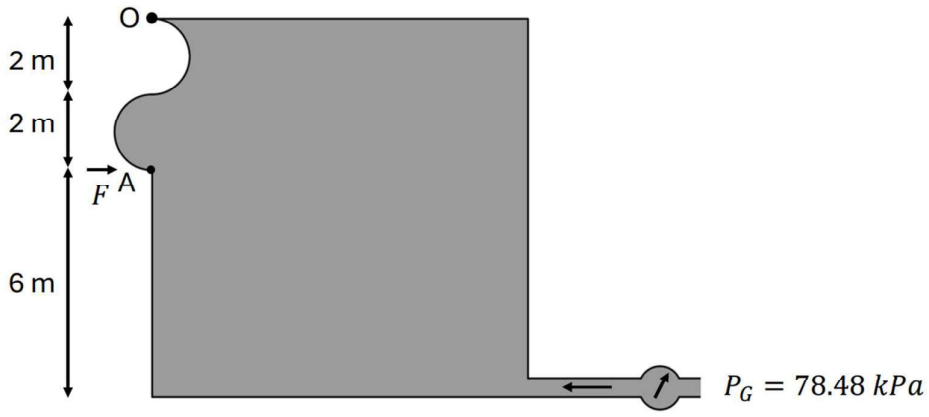
4. a) A solid cone of radius r_o and vertex angle 2θ is to rotate at an angular velocity ω. An oil of viscosity μ and thickness h fills the gap between the cone and the housing. Determine torque T required to rotate the cone. (6)



b) Using Buckingham's π-method, show that the resistance 'F' to the motion of sphere of diameter 'D' moving with a uniform velocity 'V' through a real fluid of density 'ρ' and viscosity 'μ' is given by: [6]

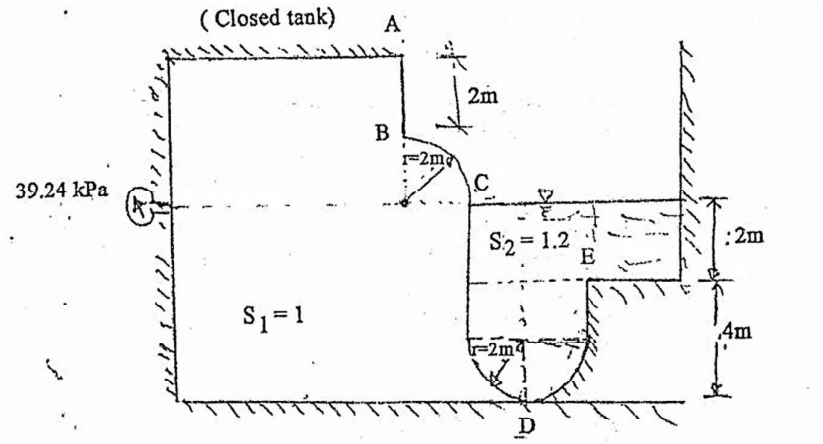
$$F = \rho D^2 V^2 f\left(\frac{\mu}{\rho V}\right)$$

5. a) A pump is used to elevate water from a tank composed of a semi circular S shaped gate (OA) having unit width perpendicular to the section given. The gate is free to rotate about a hinge at point O. The pressure gauge connected at the base of the tank shows the reading equal to 78.48 kPa. Neglecting the weight of the gate, determine the minimum force F to be applied at point A to prevent the gate from opening.(6)

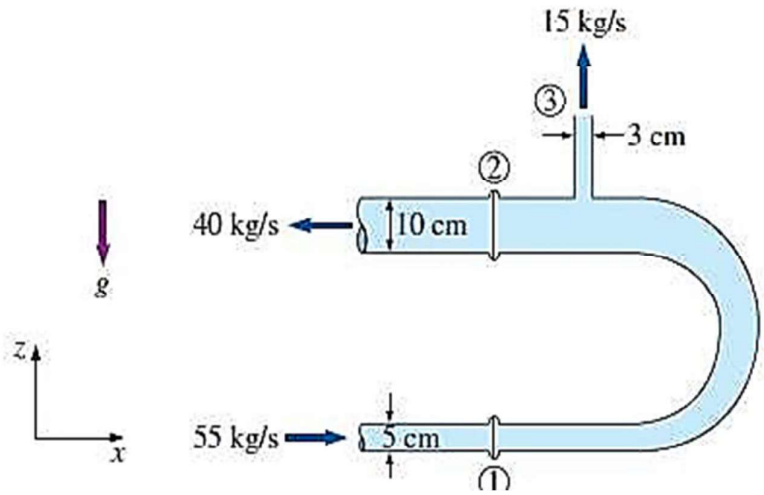


OR,

For a tank with one side closed with two liquids as shown in figure, calculate horizontal and vertical component of pressure force on curve surface ABCDE. (6)



b) Water is flowing into and discharging from a pipe U-section as shown in figure below. At flange (1), the total absolute pressure is 200 kPa, and 55 kg/s flows into the pipe. At flange (2), the total pressure is 150 kPa. At location (3), 15 kg/s of water discharges to the atmosphere, which is at 100 kPa. Determine the total x- and z-forces at the two flanges connecting the pipe. (6)



Sample Question

Subject: Computer Aided Civil Drawing **Course Code:-ENCE204**

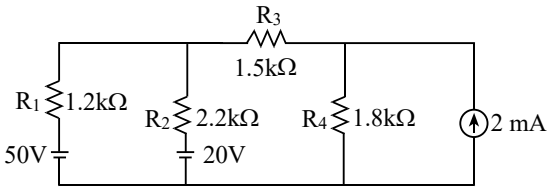
1.
   a) What do you mean by Computer Aided Design and Drafting? Explain its use in Civil Engineering. [3]
   b) Write Popular Computer Aided 2D and 3D drafting software with their specific uses. [2]
2.
   a) List Drawing and modifying tools used in AutoCAD. [2]
   b) Write steps to draw a Circle of radius 5 m and tangent to two lines.[2]
   c) What are Layers used in AutoCAD? Write down its significance.[2]
   d) Write down steps to create a new dimension style in AutoCAD.[2]
3.
   a) Draw a freehand sketch of typical Canal Section in partial cut and fill with Service Road on one bank. [4]
   b) Draw freehand sketch of a typical RCC Cantilever Retaining Wall Section and Gabion Retaining Wall Section of 5 meter height.[2+2]
   c) List information to be included in a good location map.[2]
   d) List the steps to draw Contour map using any DTM software.[3]
4.
   a) What do you mean by BIM? Explain with a typical example.[2]
   b) What is common data environment in BIM?[2]

Basic Electrical and Electronics Engineering (ENEE103)

SAMPLE FINAL EXAM QUESTIONS

- **Attempt All questions**

1. a) State ohm's law and write down its limitation. Derive the expression for equivalent resistance when connected in parallel. (3+3)
   b) Use nodal analysis to determine the current flowing through resistor R_3. (6)



2. a) A series R-C circuit has R = 20 ohms, C = 125 μF. A voltage of 200V, 50Hz is applied to the circuit. Calculate the current and power lost. (3+3)

   b) Explain working principle of single-phase transformer and derive its EMF equation. (3+3)

3. a) Describe the construction of a three-phase induction motor with a labeled diagram. Differentiate between the squirrel cage rotor and the wound rotor of a three-phase induction motor. (4+2)

   b) A 460 V series motor runs at 500 RPM taking a current of 40 A. calculate the speed if the load is reduced so the motor is taking 30 A. total resistance of the armature and field circuits is 0.8 ohm. Assume flux and field currents to be proportional. (6)

4. a) Explain how Zener diode acts as a voltage regulator for two different cases:
   - Regulation when the input voltage source varies.
   - Regulation when the load resistance varies. (3+3)

b) Explain the modes of operation of BJT. (3)

c) Define logic gate and prepare the truth table for NAND and X-OR gate. (1+2+2)

5. a) List the advantages and disadvantages of an electrical fuse. Differentiate between a fuse and an MCB. (3+2)

b) What are the types of electrical wiring system? Explain any two. (1+2+2)

Model Question

Attempt all Questions

Group A **24**

1.(a) If $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty}(a_n \cos nx + b_n \sin nx)$ represent the Fourier series for $f(x)$ in $c < x < c + 2\pi$, determine formula for finding a_n . [2]

(b) Derive the complex form of Fourier series for $f(x)$ in $0 < x < 2\pi$ [2]

(c) Find the Fourier sine integral for $f(x) = e^{-\beta x}$., $\beta > 0$. [2]

2 (a) Show that the transformation $w = \frac{2z+3}{z-4}$ maps the circle $x^2 + y^2 - 4x = 0$ into the straight line $4u + 3 = 0$ where $u = \frac{1}{2}(w + \bar{w})$. [2]

(b) By using Cauchy Riemann equation show that the function $f(z) = z^3$ is analytic everywhere in the complex plane. [2]

(c) Let $f(z)$ is analytic at z_0. Write down the Taylor series representation of $f(z)$ about z_0. Under what condition we say that point z_0 is a zero of order m of $f(z)$? [2]

(d) Evaluate $\int_C \frac{\sin 3z}{z+\frac{\pi}{2}}\, dz$ where $C: |z| = 5$ by using Cauchy's integral formula. [2]

(e) Evaluate $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$ by reducing it into complex line integral. [2]

3. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$, given that $\frac{\partial z}{\partial y} = -2 \sin y$ when $x = 0$ and $z = 0$ when y is an odd multiple of $\frac{\pi}{2}$. [2]

4. Classify the differential equation , $z_{xx} + x^2 z_{yy} = 0$. [2]

5 (a) If $Z[x(k)] = X(z)$ for $k \geq 0$ and $x(k) = 0$ for $k < 0$, then show that [2]

$$x(0) = \lim_{z\to\infty} X(z) \quad and \; x(1) = \lim_{z\to\infty} z[X(z) - x(0)]$$

(b) If $Z[x(k)] = \frac{z^2-2z}{(z-1)(z-3)}$ then find the signal $x(k)$. [2]

Group B $(\mathbf{9 \times 4 = 36})$

(6) Obtain the Fourier series of the function [4]

$$f(x) = \begin{cases} x & if \ -\pi < x < 0 \\ -x & if \ 0 < x < \pi \end{cases}$$

and hence use the series to show that

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots \ upto \infty = \frac{\pi^2}{8}.$$

(7) Find the Fourier integral representation of the function [3+1]

$$f(x) = \begin{cases} 1 & if \ |x| < 1 \\ 0 & if \ |x| > 1 \end{cases}$$

and then use it to find the integral $\int_0^\infty \frac{\sin x}{x} \, dx$.

(8) Define Fourier transform of a function and then find the Fourier transform of [1+3]

$$f(x) = e^{-ax^2} \ (a > 0)$$

(9) If the potential function is $\log(x^2 + y^2)$, find the flux function and the complex potential function. [4]

OR

Find the poles and their order of the function $f(z) = \frac{2z+3}{z^2-3z+2}$ and hence find the Laurent series expansion of the function $f(z)$ in the region $1 < |z| < 2$. [1+3]

(10) State Cauchy residue theorem and by using it evaluate the improper integral
$\int_{-\infty}^{\infty} \frac{x^2}{(x^2+a^2)(x^2+b^2)} dx \ (a > 0, b > 0)$ [1+3]

(11) Solve the partial differential equation $(x^2 - 2yz - y^2)p + (xy + zx)q = xy - zx$ by Lagrange's method

[4]

OR

Solve the partial differential equation $2zx - px^2 - 2qxy + pq = 0$ by Charpit's method.

(12) Derive one dimensional wave equation governing vertical vibration of particles of a string. [4]

OR

Derive Navier- Stoke's equation

(13) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, for $0 < x < \pi$, $0 < y < \pi$ when $u(0, y) = u(\pi, y) = u(x, \pi) = 0$ and $u(x, 0) = f(x) = \sin^2 x$ [4]

(15) Using Z-transform technique solve the following difference equation [4]

$$x(k+2) - 3x(k+1) + 2y(k) = 0, \;\; x(0) = 0, x(1) = 2.$$

Institute of Engineering, Tribhuvan University
Numerical Methods: Model Question Paper
(Time: 3 hours, Full Marks: 60)

1. Approximate a real root of the following non-linear equation correct to four decimal places using the secant method. Explain how is the secant method different from the method of false position. [4+1]

$$e^x + \sin x - 9 = 0$$

2. Solve the following system of non-linear equations using the Newton-Raphson Method for an accuracy of 2 decimal places using (3, -4) as initial approximations. [5]

$$x^3 - y = 50$$
$$x - y^3 = 75$$

OR

Write an algorithm to find a real root of a non-linear equation using the Bisection Method.

3. Solve the following system of linear equations using Do-Little's LU decomposition method. [5]

$$7x_1 + 4x_2 - x_3 = 20$$
$$8x_1 - 5x_2 + 4x_3 = 24$$
$$5x_1 + 4x_2 + 3x_3 = 28$$

4. Determine the dominant eigen value (correct to three decimal places) and corresponding eigen vector of the following matrix using the power method. [5]

$$\begin{bmatrix} 5 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$$

5. Estimate $y(9)$ from the following data using Newton's divided difference interpolation technique. [5]

x	2	4	5	8	11	12
$y(x)$	5.4	5.3	5.9	4.1	4.3	5.6

6. Using the least square method, fit the following data to a logarithmic curve ($y = a \log_e(x) + b$) and hence predict $y(3.0)$. [4+1]

x	0.2	0.6	1.0	1.4	1.8	2.2	2.6
$y(x)$	0.9	1.7	2.1	2.4	2.5	2.7	2.8

7. Evaluate the following integral using Gauss-Legendre 3-point formula and compare the result thus obtained with exact solution. [4+2]

$$\int_3^9 \sin\left(\frac{x}{2}\right) + \cos(x) + 5 \; dx$$

8. Derive expressions for evaluating the first and second order derivatives from a set of tabulated data using Newton's Forward interpolation formula. [4]

9. Write a program in Python programming language with your own logic to solve an initial value problem involving a first order ordinary differential equation for a sequence of equally spaced values of the independent variable using the Runge-Kutta fourth order method and graphically visualize the numerical solution thus obtained. [4+1]

10. Solve the following boundary value problem using finite difference approximation by dividing the boundary interval into four sub-intervals. [5]

$$y'' + 2y' - 3y = 2x \quad \text{subject to: } y(0) = 3 \text{ and } y(2) = 4$$

11. Solve the Laplace equation $\nabla^2 u = 0$ for a square mesh with the following conditions: [5]

$0 \le x \le 1$ $\quad 0 \le y \le 1$ $\quad \Delta x = h = 1/3$ $\quad \Delta y = k = 1/3$

$u(x, 0) = 900x$ $\quad u(0, y) = 600y$ $\quad u(x, 1) = 600(1 - x)$ $\quad u(1, y) = 900(1 - y)$

12. Solve the one-dimensional heat equation $2u_t = u_{xx}$ for $0 \le t \le 4$ with $0 \le x \le 5$ taking $h = 1$ using Bendre-Schmidt method, given the following initial and boundary conditions: [5]

$$u(x, 0) = x\, e^x (5 - x)$$
$$u(0, t) = u(5, t) = 0$$

SAMPLE FINAL EXAM QUESTION

- **Attempt ALL questions.**

<table>
<tr><th>Q. N</th><th>Question</th><th>Marks</th></tr>
<tr><td>1.</td><td>What is Data Science? Elaborate about the data science lifecycle.</td><td>1+4=5</td></tr>
<tr><td>2.</td><td>Why is math important in Data Science? List the cases where we use linear algebra, statistics and calculus.</td><td>2+4=6</td></tr>
<tr><td>3.</td><td>When do we use hypothesis testing? Thirty students were randomly selected to take the Data Science class. When investigating the average of their grades, the mean was 80, and the variance was 9. Find a 95% confidence interval for the average of their grades.</td><td>2+4=6</td></tr>
<tr><td>4.</td><td>Here is the customer complaint record of a service company for twelve consecutive days, and answer the following questions using this data.
<table>
<tr><td>Day</td><td>1</td><td>2</td><td>3</td><td>4</td><td>s</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td>No. of Complaints</td><td>22</td><td>12</td><td>60</td><td>57</td><td>30</td><td>32</td><td>39</td><td>14</td><td>42</td><td>13</td><td>23</td><td>16</td></tr>
</table>
i. Draw a box plot with proper labeling of all calculated values
ii. Normalize Day#9 complaints using both min-max and z-score normalization methods.</td><td>2+4=6</td></tr>
<tr><td>5.</td><td>Explain the use of eigenvalues and eigenvectors in Principal Component Analysis (PCA). For the purpose of justification and calculation, use the following data, where each row represents a customer and each column represents their preference score for different products and the goal is to reduce the dimensionality of the data (from 3 to 2 dimensions only) while retaining as much information as possible.
<table>
<tr><td colspan="2">Customer ID</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td rowspan="3">Customer Preferences</td><td>Product A</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>Product B</td><td>5</td><td>4</td><td>3</td><td>6</td><td>7</td></tr>
<tr><td>Product C</td><td>2</td><td>3</td><td>2</td><td>4</td><td>5</td></tr>
</table></td><td>2+5=7</td></tr>
</table>

<table>
<tr><td>6.</td><td>What is Data Visualisation? Explain the principles of effective visualization. How is the right visualization chart chosen ?</td><td>2+2+2=6</td></tr>
<tr><td>7.</td><td>Compare Linear Regression with the Logistics Regression. Explain how the Logistic regression acts as a classifier with examples.</td><td>3+3=6</td></tr>
<tr><td>8.</td><td>Discuss the different approaches for validating a classifier with calculating the accuracy of this Covid case test data. A confusion matrix for covid testing classifier is as follows:
<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="2">Predicted Covid Cases</td></tr>
<tr><td>True</td><td>False</td></tr>
<tr><td rowspan="2">Actual Covid Cases</td><td>True</td><td>456</td><td>52</td></tr>
<tr><td>False</td><td>78</td><td>11569</td></tr>
</table>
Is accuracy sufficient to indicate the performance of this classifier? Justify with calculations and comparison of other parameters like precision , recall and F-1 scores.</td><td>2+4=6</td></tr>
<tr><td>9.</td><td>Write short notes on the following: -
i. Data Wrangling
ii. Exploratory Data Analysis
iii. Responsible Data Usage</td><td>(3*3) =12</td></tr>
</table>

Subject: Manufacturing and Production Process

Attempt **All** questions.

1. Determine the selection criteria for green design and manufacturing? Describe the four main stages of product life cycle. [8]
2. What is pattern in sand casting and write its function during casting process? What are the application of plastic and composite material in modern plants and industries [8]
3. Explain the wire drawing process. Explain about spring back in sheet metal. [7]
4. Explain the significance of Advance Machining process. Explain the mechanism of Laser-beam machining and discuss the factors that affect its performance and accuracy. [8]
5. Why flexible automation and numerical control is necessary on manufacturing process. Differentiate hard automation vs soft automation. [8]
6. The technician needs to machine 150 mm long rod bar from 65 mm to 60 mm diameter. The spindle speed, N is 500 rpm and axial speed is 250 mm/min. Calculate the MRR and cutting time. [6]
7. Why is rapid prototyping essential in manufacturing and design? Briefly Explain Stereolithography (SLA) printing. [8]
8. Explain the different types of metal joining process. What are the consideration for the economics of joining process? [7]

Subject: Material Science, ENME 201

√ Attempt ***All*** questions.

1. a. How do mechanical properties influence material selection in engineering design? [4]
   b. A gas is diffusing through a thin membrane. The diffusion coefficient D for the gas is 1.5×10^{-5} m^2/s, and the concentration gradient across the membrane is 100 mol/m^3. Calculate the diffusion flux for the gas. [4]

2. What are the different types of hardness tests used in materials science? Why is hardness testing important in industrial applications such as machining and wear resistance? [4+4]

3. What is solidification? How does solid solution strengthening improve the mechanical properties of metals? [2+6]

4. a. What are the key advantages of non-ferrous metals over ferrous metals? [4]
   b. How does heat treatment improve wear resistance in tools and dies? [4]

5. a. What are the key properties of ceramics that make them useful in engineering applications? [5]
   b. What is the difference between thermoplastics and thermosetting plastics? [5]

6. What are the challenges in large-scale production of nanomaterials? [5]

7. How are natural fiber composites different from synthetic fiber composites, and what are their environmental advantages? [8]

8. What are the main methods of preventing corrosion in metals? [5]

Subject:- Logic Circuit (ENEX 203)

Attempt **All** questions

1. What is a BCD code? Design 3-bit Gray code to binary code converter with truth table. [1+ 3]
2. Convert the followings as indicated: [3 × 1]

   (a) $(10101)_2 = (\ ?\ )_G$

   (b) $(329)_{10} = (\ ?\ )_{BCD}$

   (c) $(E24.BC8)_H = (\ ?\ )_8$

3. Simplify the following Boolean function using K-map and draw the circuit of simplified expression using

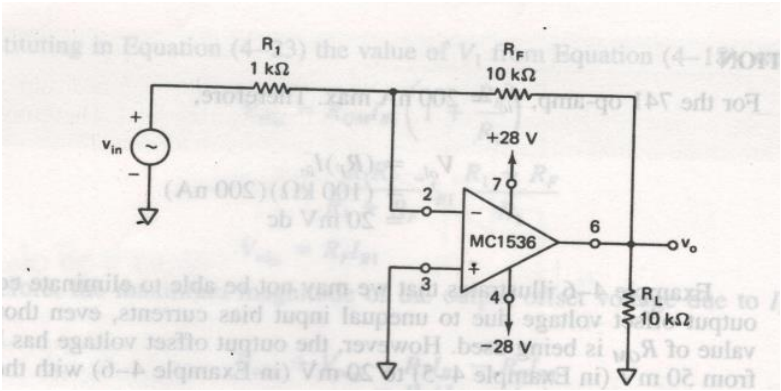
   NOR – NOR logic function only.

   $$Y = \sum\Pi\,(0, 1, 4, 5, 7, 8, 13, 14) + d(2, 3, 9, 10)$$ [3+2]

4. Design a logic circuit which can realize both half-adder and half-subtractor. [4]
5. Define multiplexer. Realize a full-adder circuit using a single 3×8 decoder and necessary logic gates. [1+3]
6. Design a decimal priority encoder with corresponding truth table, logic expressions and neat circuit diagram. [5]
7. Explain briefly the operation of positive edge-triggered JK flip-flop with its truth table, excitation table and find out its characteristics equation. [5]
8. Convert D flip-flop into T flip-flop with necessary logic expressions and logic circuit diagram. [6]
9. Explain briefly about how 1011 data can be stored and retrieve in 4-bit serial-in serial-out (SISO) shift register with neat diagram and its corresponding data transfer timing diagram. [6]
10. Describe the operation of decade ripple counter using positive-edge triggered JK flip-flops with neat logic circuit diagram and timing diagram. [5]
11. Design a sequential machine which consist of a single input, X and the single output, Z. The machine is required to give output Z high when it contains serial message 101. Use D flip-flops only to realize the desired machine design. [10]
12. Explain briefly about how counter can be used for the measurement of time period of the frequency with necessary diagrams and the neat logic diagram. [4]

Subject:- *A*dvance Electronics *(ENEX 202)*

*Attempt **All** questions.*

1	Show that gain bandwidth product of an op-amp is constant. Define slew rate of op-amp	4+2
2	Compute the maximum possible total output offset voltage in the amplifier circuits shown in figure. Calculate the value of R_{OM}. Calculate maximum possible total output after the connection of R_{OM}. The op-amp is MC1536 with the following specifications: Vio= 7.5 mV maximum; Iio = 50 nA maximum; I_B = 250 nA at $T_A = 25^0$C. 	6
3	Derive the output voltage expression for binary weighted resistor DAC.	1+4
4	Describe the working of Dual slope ADC with help of necessary figures.	2+2
5	Draw the circuit diagram of one op-amp instrumentation amplifier. Derive its voltage gain rejecting common mode noise	1+4
6	**Derive the expression for the output voltage for logarithmic amplifier using Matched Transistors. Is it Temperature independent?**	1+4
7	Design a circuit that generates the square root of an input voltage and derive its input output relationship. Draw a circuit that produces the output voltage Vout = $[(V1.V2)^2 + (V3.V4)^2]^{1/2}$	6
8	Explain the construction and working of SCR with necessary diagram and VI characteristics. Also explain different protection methods of SCR.	5
9	**Describe the operation of Step up chopper with necessary figures and expressions. How it can be used in regenerative braking mode.**	1+4
10	What is the advantage of PWM inverters. Derive the expression for output voltage of multiple PWM.	5
11	Explain the working of Buck regulator	4
12	Explain the working of single phase half wave converter drive.	4

***Subject*: - Microprocessors (*ENEX 201*)**

*Attempt **All** questions.*

1. Define Microprocessor. Explain stored program concept used in Von-Neumann Computer. [**1+4**] [**Chapter- 1**]
2. Explain the working principle of JMP and CALL instruction with example. [**4**] [**Chapter- 2**]
3. Write a program in 8085 to find the largest and smallest bytes from the list of 20 bytes stored starting from memory location D080H. Store the largest byte and smallest byte in C070H and C071H respectively. [**5**] [**Chapter- 2**]
4. Draw and explain the timing diagram of MVI M,80H. Calculate the time required such instruction with operating 2MHz clock frequency. [**5+1**] [**Chapter- 2**]
5. Explain the execution unit of 8086 with diagram. How is a 20-bit physical memory address calculated in the 8086 microprocessors with example. **[4+2] [Chapter- 3]**
6. Explain the frequently used directives of 8085 microprocessor with suitable example. [**5**] [**Chapter- 3**]
7. Write an ALP in 8086 to read a word and display all the alphabets in alternate case (first alphabet in lowercase. second in uppercase, third in lowercase and so on) in clear window. [**5**] [**Chapter- 3**]
8. Deign an address decoding circuit to interface 4 KB PROM and 2KB R/W CMOS memory using 3*8 Decoder. The starting address is 4000H. **[6]** [**Chapter- 4**]
9. What do you mean by interrupt? Explain the SIM and RIM instruction in detail. [**1+3**] [**Chapter- 5**]
10. Explain how interrupt vector table is used to handle interrupts in 8086 microprocessors. [**5**] [**Chapter- 5**]
11. Write short note: [**3*3=9**]
    (a) One Pass Assembler and two pass Assembler [**Chapter- 3**]
    (b) 8255A PPI [**Chapter- 4**]
    (c) RISC and CISC [**Chapter- 6**]

Subject: Electrical Engineering Material – II (*ENEE203)*

- ✓ *Attempt **All** questions.*
- ✓ *Mass of electron, $m_{e=9.1*10^{-31}}Kg$;* *$1ev=1.6*10^{-19}J$*
- ✓ *$h=6.624*10^{-34}Js$;* *$k=1.38*10^{-23}J/k$*
- ✓ *$n_i=1.45*10^{10}/cm^3$ for si;* *$\mu_{n=1350cm^2V^{-1}S^{-1}}$ (at 300K)*
- ✓ *$\mu_{h=450cm^2}$ /v.s(at 300K)* *$N_{A=6.022*10^{23}}/mol$*
- ✓ *Permitivity of silicon $\varepsilon=\varepsilon 0\varepsilon r = 11.9*8.85*10^{-12}F/m$*
- ✓ *Velocity of light=$3*10^8m/s$* *mass of photon=$1.673*10^{-27}kg$*

1 a)	Define the wave-particle duality of the matter. Derive the expression of time independent Schrodinger wave equation.	[5]
1 b)	Molybdenum has BCC crystal structure unit cell having atomic mass of 95.94 gm/mol and a density of 10.22 g/cm. Calculate atomic concentration, lattice parameter (a) and atomic radius of molybdenum.	[3]
2 a)	Define the terms drift velocity, mobility and electrical conductivity for the electrons in metal with necessary expressions.	[6]
2.b)	At what temperature we can expect a 10% probability that electrons in silver have energy, which is 1% above the Fermi level. E_F = 5.5 ev for silver.	[4]
3.a)	Define polarization. Mention different types of polarization in case of dielectric materials. Explain electronic polarization.	[4]
3.b)	Explain how? (i) Average dipole moment in dipolar polarization depends on temperature.	[2]
3.c)	How does electromechanical breakdown process lead to dielectric breakdown in solid dielectrics? Write down the difference between pyro-electricity and piezo-electricity.	[4]
4.a)	Explain paramagnetism and ferromagnetism with suitable examples of each.	[5]
4.b)	How hysteresis loop plays an important role in classifying magnetic materials? Explain.	[5]
5.a)	Explain the different limiting factors for a superconductor to remain in its superconducting state? Write down the difference between type I and type II superconductors with suitable examples and necessary figures.	[6]
5.b)	Derive the expression for electron concentration in intrinsic type semiconductor.	[4]
6.a)	Given that the density of states related effective masses of electrons and holes in Si are approximately $1.08m_e$ and $0.60m_e$ respectively and the electron and hole drift mobilities at room temperature are 1350 and 450 $cm^2V^{-l}S^{-1}$ respectively. Calculate the intrinsic concentration and intrinsic resistivity of Si. The energy band gap for Si is 1.10ev. (T = 300K).	[4]
6.b)	Calculate the diffusion coefficient of electrons at 300K in n-type silicon semiconductor with 10^{15} arsenic atoms per cm^3. ($\mu=1300cm^2V^{-1}s^{-1}$)	[3]
6.c)	Differentiate between degenerate and non-degenerate semi-conductors.	[5]

Subject: - Electric Machines I (ENEE202)

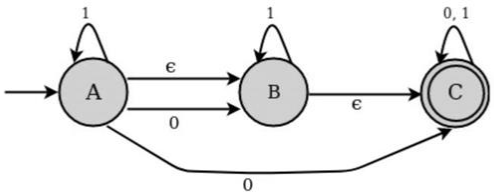
Attempt **All** questions**.**

Q.N.	Questions	Marks	Chapter
1.	Explain the hysteresis loop of a magnetic material used in electrical machine. Prove that the area of the loop is proportional to the energy loss per cycle per unit volume	6	1
2.	Explain how the efficiency of a transformer varies with load. Derive the condition for maximum efficiency.	6	2
3.	A 20 kVA, 250/2500V, 50 Hz, single phase transformer has Ro= 595.2, Xo = 187.26 Ω. Ro1 = 0.05 Ω and Xo1 = 0.14 Ω. Calculate (i) iron loss of the transformer (ii) efficiency of the transformer at half load with 0.8 pf lagging.	6	2
4.	Why parallel operation of transformers is needed? Write the conditions for parallel operation of Transformers	6	2
5.	Explain the construction and operating principle of a dc generator.	6	3
6.	A 4-pole d.c. shunt generator with a wave-wound armature has to supply a load of 500 lamps each of 100 W at 250 V. Allowing 10V for the voltage drop in the connecting leads between the generator and the load and drop of 1V per brush. calculate the speed at which the generator should be driven. The flux per pole is 30 mWb and the armature and shunt field resistances are respectively 0.05 Ω and 65 Ω The number of conductors is 390.	6	3
7.	DC series motor should not be started at no load, why??	3	4
8.	A 240 V DC shunt motor runs at 800 r.p.m. and takes armature current of 2A. Find the resistance required in series with the shunt winding so that the motor may run at 950 rpm when taking an armature current of 28 A. Assume flux is proportional to field current. Shunt field resistance is 160 Ω, armature resistance is 0.4 Ω.	6	4
9.	Explain the Torque-slip characteristics of 3-phase induction motor.	6	5
10.	A 4-pole, 400 V. 3 phase induction motor has a standstill reactance of 0.5 ohm per phase, standstill rotor emf of 100 V per phase and rotor resistance of 50 milliohm per phase. Calculate the maximum torque and the slip at which it occurs. Neglect the stator impedance.	6	5
11.	Explain the operation of three phase induction motor as induction generator in grid connected mode	3	5

Subject: **- Theory of Computation**

*Attempt **All** questions.*

1. a) State pigeonhole principle. Using the pigeonhole principle, prove that in any group of 8 people, at least 2 were born in the same days. [3]
   b) Define the term converse, inverse and contrapositive of an implicative statement. State rules of inference for propositional statements [2+2]
   c) What are Kleene closure and language of an alphabet. [2]
2. a) Design a DFA with $\sum = \{0, 1\}$ that accepts all strings containing even number of zeroes and even number of ones. Verify your design using suitable example. [4]
   b) State pumping lemma for regular language. Convert the following NFA into equivalent DFA [1+5]



   c) Show that regular languages are closed under concatenation, complement and intersection [3]

3. a) Construct CFG for the language that has equal number of a and b over $\sum(a, b)$. Test your grammar to generate w=babbabaa and draw parse tree for the same. [4]
   b) Design a PDA for the language that accepts all the string of $L=a^m b^n$ with m>1 and n>=0 and check the string w=aaaabbbbbb . [5]
   c) How the production rules of CFG can be converted into CNF? Explain with the example of your own. [4]

4. a) Design a TM that recognize the language that can recognize the palindrome string of even length over $\sum(0,1)$ [6]
   b) Explain Chomsky hierarchy of grammar. How Turing Machine can be used as enumerator. [2+3]
   c) Describe TM with multiple tape. How multi-tape Turing machine can be converted into single tape. [3]

5. a) What are halting problems. Justify why halting problem are undecidable. [3]
   b) Explain Class-P and Class-NP problems. [2]

6. a) Explain the working mechanism of the lexical analyzer . [3]
   b) How parse tree of the grammar is generated by parser. [3]

Subject: Computer Graphics and Visualization

Q. No.	Questions	Chapter	Marks
1.	What is computer graphics? Explain the shadow mask method in raster system in brief	1	2+3
2.	a. Digitize the line with end points (20,15) and (30,30) using Bresenham's Line Drawing algorithm.	2	5
	b. Use Liang-Barsky's line clipping algorithm to clip the line with endpoints (1, 7) and (7, 1) against the clipping window whose principal diagonal coordinates are (2, 2) and (8, 8) respectively.		5
	c. Differentiate between flood fill algorithm and boundary fill algorithm		3
3.	a. What do you understand by homogeneous coordinates? Determine the composite transformation matrix to rotate a triangle vertices A (4, 1), B (5, 2) and C (4, 3) by 30^0 about the pivot point (7, 3). What are the vertices of the triangle after the rotation?	3	1+3+2
	b. Describe the 3D viewing pipelining in brief. Derive the transformation matrix for the Parallel Projection		3+4
4.	Find the coordinate at U = 0.25, U = 0.5, and U =0.75 with respect to the control points (3, 1), (6,2), (2, 5) and (16, 15) using Bezier function. And plot Bezier curve with your calculated coordinates. What are the conditions for error free generation of a polygon table?	4	4+2
5.	Explain depth buffer method in detail. Compare it with A-buffer method.	5	4+1
6.	Find out the Total Intensity at the centroid of triangle defined by P(2,1,0), Q(0,1,1), R(1,1,2) When illuminated by a point light source with intensity I_L=0.6 at (2,2,6) using illumination Model. The Viewer is at (2,0,6). Assume ambient Light Intensity Ia=0.1 and parameter Ka=0.4, Kd=0.7, Ks=0.6 and n=8.	6	5
7.	Define computer animation. List out some of the computer animation functions. Differentiate between kinematics and dynamics motion specification	7	1+2+4
8.	Explain the application of VR system in gaming technology. What are the input and output devices used in VR?	8	3+3

TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2081 Chaitra

Exam.	**Regular**		
Level	Bachelors	**Full Marks**	**30**
Program	**BE**	**Pass Marks**	**12**
Year/Part	**II/I**	**Time**	**1.5 hrs**

Subject: - **Concrete Technology (ENCE 205)**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.

1(a) How can the shape of aggregate effect the properties of hardened concrete? (4)

1(b) How is fineness modulus of sand determined in laboratory? (2)

2. Define workability. Briefly explain the method of test for bleeding of concrete. (1+3)

3. Describe the steps for mix design of concrete by ACI method. (6)

4. Explain effect of cyclic loading in concrete. Explain the physical causes of concrete deterioration. (6)

5. Describe compressive strength test for concrete. Explain ultrasonic pulse velocity test. (3+2)

6. Explain self-healing concrete. (3)

Sample Questions

Subject: - Building Construction II **Course Code: - AR504**

Please Tick ( ) the Needed Instructions.
Candidates are required to give their answers in their own words as far as practicable.
Attempt **All / Any** …… questions.
The figures in the margin indicate **Full Marks.**

Q. N.	Description	Marks	Chapter No.
1	What do you understand by the term "Underpinning"? Describe different steps carried out during the process. OR Define "Scaffolding". Describe raking shore in details with appropriate design consideration and figure.	[2+6]	(1)
2	Design a suitable staircase in a new school building with (4600 X 5700 X 3600) dimension. Draw plan, section, show line of nosing and baluster details to support your design.	[6]	(2)
3	What are the major considerations that should be made while defining the position of doors and windows? Draw a door and a window of a suitable size showing the following components - Sill, Lintel, Frame, Styles, Lock rails, Mullion and head.	[2+2]	(3)
4	What are the advantages of RCC Structure over contemporary structures? Describe some possible causes of failures of RCC structures.	[3+3]	(4)
5	Write short notes on **ANY TWO**: a) Cantilever Retaining wall b) Double roof construction c) Queen post roof Truss	[2 x 3]	(5,6,)

Subject: **History of Eastern Architecture (ENAR 202)**

*Attempt **All** questions.*

1. Explain how the form of Hindu temples evolved over the course of Indian architectural history, from the Gupta to the Chalukyan periods. [12]
2. Argue about the development of rock-cut architecture throughout that time period with reference to the Hindu temples of Ellora. [12]
3. Demonstrate the evolution of mosque architecture throughout Islamic India's history, from the early period to the Mughal Empire. [12]
4. a. Make a brief analysis of the architecture of ancient Japanese temples. [6]
   b. Discuss the ancient temple architecture of Cambodia with respect to Ankar Wat Temple. [6]
5. Write short notes on any three. [4x3=12]
   a. Mohenjo-Daro's settlement planning
   b. Buddhist stupa
   c. Ranakpur Jain temple
   d. Hoysala temple architecture