Purbanchal University

Faculty of Engineering

Biratnagar, Nepal

Third Semester's Course Structure

Program: Bachelor in Electronics Communication & Automation Engineering

Effective from 2021 (2078) Batch

Year-II **Semester-III**

S.N.	Course code	Subject	Credit Hours	L	T	P	Total	Internal		Final		Total
								Th.	P	Th.	P	
1		Mathematics III	3	3	3	-	6	40		60	-	100
2		Electromagnetics	3	3	1	1.5	5.5	40	30	60	20	150
3		Network Analysis	3	3	1	1.5	5.5	40	--	60	-	100
4		Electronic Circuits	3	3	1	3	7	40	30	60	20	150
5		Microprocessor	3	3	1	2	6	40	50	60	-	150
6		Database Management System	3	3	1	3	7	40	25	60	-	125
		Total	18	18	8	11	37					775

Note- **L:** Lecture **T:** Tutorial **P :** Practical **Th. :** Theory

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Biomedical/Civil/Computer/Electrical/Electronics Comm. & Automation/Geomatic Engineering

Subject: BSH---- MATHEMATICS III

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	-	100
3	3	3	-	6	3 Hrs.	60	-	-			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

OBJECTIVES: The main objective of this course is to provide students a sound knowledge of Linear Algebra, Laplace Transform, Vector Calculus with Integral Theorems, Fourier series and Linear Programming Problems with respective applications.

1. Determinants and Matrices **11 Hrs**

1.1 Review of Matrices: types, transpose and inverse with properties (without proof) and applications

1.2 Review of Determinants: Introduction, Properties (without proof), applications

1.3 Vector spaces: Introduction, Dependent and independent Vectors, Linear transformation

1.4 System of linear equation and techniques to solve it (Gauss elimination method only), Elementary row operations, Gauss-Jordan method to find inverse of a matrix.

1.5 Rank of the matrix: Echelon Form and Normal Form, Application of the Rank

1.6 Eigen values and Eigen Vectors of matrix with applications, Cayley-Hamilton Theorem and its applications in finding inverse of a matrix

2. Laplace Transform **10 Hrs**

2.1 Introduction

2.2 Laplace Transforms of elementary functions

2.3 Properties of Laplace Transform

2.4 Inverse Laplace transforms

2.5 Application of Laplace Transform in solving differential equations with initial conditions

2.6 Convolution of Laplace transform, Inverse of Laplace transform using convolution

3. Line Integrals, Surface Integrals and Volume Integrals **13 Hrs**

3.1 Line Integrals: Introduction, evaluation, application as work done, independent of Path, Conservative fields

3.2 Surface Integrals: Introduction, evaluation, application as flux

3.3 Volume Integrals: Introduction, evaluation, Dirichlet's Integral

3.4 Integral Theorems

- Green's Theorem in the plane (without proof), its applications.
- Stoke's Theorem (without proof), its applications.
- Gauss' Divergence Theorem (without proof), its applications.

4. Fourier Series **6 Hrs**

4.1 Introduction, Periodic Functions, odd and even functions

4.2 Fourier Series: Introduction, evaluation (Period 2π and arbitrary period)

4.3 Half Range Fourier (sine and cosine) Series: Introduction, evaluation

4.4 Parseval's Formula

5. Linear Programming Problem **5 Hrs**

5.1 Review of Simplex method and duality (Converting in to dual)

5.2 Big-M Method and Two Phase Method

Text Book

1. Zill D., Wright W. S. and M. R. Cullen, *Advanced Engineering Mathematics*, Jones and Bartlett Publishers Inc.
2. Kreyszig, E. (1999), *Advanced Engineering Mathematics, 9th Edition*, John Wiley and Sons.
3. Peter V. O'Neil , *Advanced Engineering Mathematics* , 8th Edition , University of Alabama at Birmingham

Evaluation Scheme

Internal Assessment: 40

Final Examination: 60

Chapter-wise Marks Division for Final Exam

Unit	Chapter Name	Short questions (2 marks)	Long questions (4 marks)	Total Marks
1	Determinants and Matrices	4	2	16
2	Laplace Transform	3	2	14
3	Line Integrals, Surface Integrals and Volume Integrals	1	4	18
4	Fourier Series	2	1	8
5	Linear Programming Problem	-	1	4
	Total	10	10	60

NOTE: *There may be at most one OR question from each unit 1, unit 2 and unit 3. There will be altogether three OR questions in the final question paper.*

Sample Question Paper

PURWANCHAL UNIVERSITY
3rd SEMESTER (NEW)

Level- B.E (civil/ computer/Electronics and Communication/ Electrical/ B.Arch)

Subject- BOE, SH Engineering Mathematics – III
Time – 3:00 hrs

Full marks- 60
Pass marks- 24

GROUP -A

Answer all the questions: [10X2 = 20]

1. Find the value of determinant $\begin{vmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{vmatrix}$
2. Define the Hermitian matrix with example
3. If A is the Hermatian matrix, then show that iA is skew Hermatian matrix.
4. Define adjoint and inverse of a 3x3 matrix.
5. Find the inverse transformation of $y_1 = 3x_1 - x_2$, $Y_2 = -5x_1 + 2x_2$
6. Find the Laplace transform of tcosat.
7. Find the inverse transform of $\frac{1}{s(s+1)}$,
8. Evaluate $\int_c \vec{f}.\overrightarrow{dx}$, where $\vec{f} = x^2y^2\vec{i} + y\vec{j}$ and c is the curve $y^2 = 4x$ from (0, 0) to (4,4).
9. Definer Fourier cosine series.
10. Show that the given functions are odd or even:
    (a) $\frac{e^x + e^{-x}}{2}$ (b) $2 - 3x^4 + \sin^2 x$

GROUP – B

Answer all questions (4 X 10 = 40)

11. Solve the system of linear equation s x- 2y+3z= 11, 3x+y-z= 2, 5x+3y+2z=3 by Gauss Jordan method.
12. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 4 & 2 & -8 \end{bmatrix}$ by reducing to normal form.

    Or

    Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 2 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & -1 & 3 \end{bmatrix}$.
13. Find the inverse of Laplace transform of $\frac{1}{s^2(s^2+a^2)}$ by using convolution theorem.

14. Solve the equation by transform method
    $Y'' + y' - 2y = t$, $y(0) = 1$, $y'(0) = 0$

    Or

    Solve $\frac{dx}{dt} - y = e^t$, $\frac{dy}{dx} + x = \sin t$ given that $x(0) = 1$, $y(0) = 0$
15. Show that $\vec{F} = (x^2-yz)\vec{i} + (y^2 = zx)\vec{j}+(z^2-xy)\vec{k}$ is irrotational. Also find its scalar potential function.
16. Find the flux of $\vec{F}$ through surfaces where $\vec{F} = 3x\vec{i} +3y\vec{j} +3\vec{k}$ and part of the surface $x^2+y^2+z = 9$ with $z \geq 0$.
17. Evaluate by Green's theorem $\int (y - \sin x)dx + \cos x dy$ where c is the plane triangle enclosed by the lines $y = 0$, $x = \frac{\pi}{2}$ and $y = \frac{2x}{\pi}$.
18. Apply Stoke's theorem to evaluate $\int_c (x + y)dx + (2x - z)dy + (y + x)dz$, where c is the boundary of the triangle with vertices (2,0,0) ,(0,3,0) and (0,0,6).

    Or

    Evaluate $\iint_s (\vec{F} . \hat{n})ds$ where $\vec{F} = 2x\vec{i} + 3y\vec{j} + 4z\vec{k}$ and S is the surface of sphere $x^2 + y^2 + z^2 = 1$ by Gauss's divergence theorem.
19. Find the Fourier series $F(x) = 2x - x^2$ in the interval (0, 2).
20. By using Big M method, minimize $z = x_1-3x_2+2x_3$ subject to the condition

$$3x_1 - x_2+2x_3 \leq 7$$
$$- 2x_1 + 4x_2 \leq 12$$
$$- 4x_1 + 3x_2 + 8x_3 \leq 10$$
$$x_1, x_2, x_3 \geq 0$$

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Purbanchal University

Faculty of Engineering, Biratnagar, Nepal
Syllabus

Level: Bachelor
Program: Bachelor in Electronics Communication & Automation Engineering
Subject: ELECTROMAGNETICS
Subject Code: BEC----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	25	125
3	3	1	1.5	5.5	3 Hrs.	60	-	-			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course Objectives: The objectives of this course is to provide the knowledge to understand the fundamental laws of static and dynamic electric and magnetic fields and apply electromagnetic fields and waves theory in the generation, transmission and measurement techniques.

1. Introduction: **(3hrs)**
- 1.1 Scalars and vectors
- 1.2 Vector algebra
- 1.3 Coordinate system: Cartesian, Cylindrical and Spherical
- 1.4 Scalar and vector operations in different coordinate systems

2. Electric Field Intensity: **(3hrs)**
- 2.1 Coulomb's law
- 2.2 Electric field intensity
- 2.3 Field due to point charges, line charge and sheet of charge

3. Gauss's Law and Applications: **(3hrs)**
- 3.1 Electric flux density
- 3.2 Gauss' s law in integral form
- 3.3 Application of Gauss's law: point, line, sheet charge
- 3.4 Boundary condition at a conductor surface

4. Divergence: **(3hrs)**
- 4.1 Physical significance of Divergence
- 4.2 Maxwell's first equation and applications
- 4.3 Divergence theorem and application

5. Energy and Potential: (4hrs)

5.1 Electric energy
5.2 Potential and Potential difference
5.3 Potential field of a point charge and system of charges
5.4 Potential gradient
5.5 Electric intensity as the negative gradient of a scalar potential
5.6 Conservative fields
5.7 Electric energy density

6. Electrostatic Field in Material Media: (2hrs)

6.1 Polarization
6.2 Free and bound charge densities
6.3 Relative permittivity
6.4 Capacitance Calculations: parallel plates and concentric

7. Boundary Value Problems in Electrostatics: (4hrs)

7.1 Laplace's and Poisson's equations
7.2 Uniqueness theorem
7.3 One-dimensional and two-dimensional boundary value problems

8. Current and current density: (2hrs)

8.1 Conversation of charge
8.2 Continuity of current
8.3 Point form of Ohm's law
8.4 Relaxation time constant

9. Magnetic force and material: (2hr)

11.1 Magnetic force and magnetic moment on a moving charge
11.2 Force on a differential current element
11.3 Classification of magnetic materials
11.4 Magnetization and permeability
11.5 Magnetic circuits

10. Magnetostatics: (2hrs)

9.1 Magnetic field intensity and magnetic flux density
9.2 Biot-Savart’s Law and its applications
9.3 Ampere's circuital law and its applications

11. Curl: (3hrs)

10.1 Physical significance of Curl
10.2 Stoke's theorem
10.3 Ampere's law in point form
10.4 Scalar and vector magnetic potentials
10.5 Boundary value problems

12. Time- Varying fields and Maxwell's Equations: (3hrs)

12.1 Faraday's law
12.2 Inadequacy of Ampere's law with direct current, Conflict with continuity equation, Displacement current
12.3 Maxwell's equation in point form, Maxwell's equation in integral form
12.4 Retarded potential

13. Wave Equation and Propagation: **(7hrs)**

13.1 Wave propagation in free space, perfect dielectric and lossy medium
13.2 Wave impedance, Skin effect, A.C. resistance
13.3 Poynting vector
13.4 Reflection of uniform plane waves: Reflection and Transmission coefficients
13.5 Standing wave ratio
13.6 Impedance matching

14. Transmission Lines: **(4hrs)**

14.1 Introduction
14.2 Physical Description of Transmission line propagation
14.3 Transmission line equations
14.4 Lossless propagations: Characteristic impedance, input impedance, phase constant, phase velocity

Note: Expressions for Gradient, Divergence, Curl and Laplacian of Cylindrical and Spherical coordinate system must be proposed in final exam.

Laboratory:

l. Coordinate Conversion
2. Measurement of Dielectric Constant
3. Electric Field Plotting- Regular and regular Shape
4. Transmission Line Parameters using simulation software
5. Waveguide Familiarization
6. Magnetic Field measurements in a static magnetic circuit

Reference Books:

1. V. H. Hayt, "Engineering Electromagnetic",TataMcGraw Hill Book Co., New Delhi
2. J.D. Kraus & K. R. Carver, "Electromagnetics"
3. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Press

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Electrical/ Electronics Communication & Automation Engineering

Subject: NETWORK ANALYSIS

Subject Code: BEL----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	10	125
3	3	1	2	6	3 Hrs.	60	-	15			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course Objective: - To provide the knowledge of transient and steady state behavior of various electric networks subjected to different types of inputs, synthesize one port network functions and introduce two port network parameters.

1. **Matrix methods in Network Analysis [4 hours]**
   Review of Mesh analysis and nodal analysis involving independent and dependent sources; Solution of mesh analysis using Gauss elimination, Gauss Jordan and Cramer's rule; Solution of nodal analysis using Gauss elimination, Gauss Jordan and Cramer's rule

2. **Classical solution of First order differential equation [6 hours]**
   Differential operator, operational impedance, Forced and transient solution, formulation of differential equations; Initial conditions, procedure to evaluate initial condition, transient and steady state response, zero input response and zero state response; Complete response of series RL circuit to step, exponential and sinusoidal inputs using classical approach, Time constant of RL circuit; Complete response of series RC circuit to step, exponential and sinusoidal inputs using classical approach, Time constant of RC circuit

3. **Classical solution of Second order differential equation [6 hours]**
   Formulation of second order differential equation in second order circuit (series or parallel RLC circuit), Nature of solution of homogeneous and non-homogeneous differential equation , General solution for underdamped, critically damped and overdamped second order network; Step voltage response of series RLC network, step current response of parallel RLC network; Particular integral by the method of undetermined coefficients; Complete response of RLC (series or parallel) circuit with exponential and sinusoidal input; Response of series RLC circuit as related to the S-plane location of roots

4. **Laplace and Inverse Laplace Transform [4 hours]**
   Definitions and properties used for Network Analysis; Laplace transform of common forcing functions, step, ramp, impulse and sinusoidal functions, shifted functions; Initial value theorem, final

value theorem, first and second shifting theorem; Use of partial fraction expansion in analysis using Laplace transformation, Heaviside's partial fraction expansion theorem

5. **Solution of ordinary differential equations using Laplace transformation technique [7 hours]**
   Complete response of series RL circuit to step, exponential and sinusoidal inputs; Complete response of series RC circuit to step, exponential and sinusoidal inputs; Complete response of series RLC networks to step, exponential and sinusoidal inputs; Complete response of series RLC networks to step, exponential and sinusoidal inputs; Laplace transform of some special waveforms like staircase, truncated ramp etc. that can be synthesized using step and ramp signals, RL and RC excitation using these waveforms as forcing function

6. **Transfer Functions [4 hours]**
   Transform impedance and admittance; Network functions for One-port network; Network functions for a two-port network; Transfer function- Transform impedance, Transform admittance, driving point impedance, driving point admittance, voltage transfer ratio, current transfer ratio, transfer admittance, transfer impedance; Poles and Zeros plot and analysis; Time-domain behavior from pole-zero locations; Stability and Routh's Criteria

7. **One -Port Passive Networks [7 hours]**
   Hurwitz polynomial and properties of Hurwitz polynomial; Positive real function and properties of p.r.f.; Properties of LC, RL and RC network functions; Synthesis of RL, RC and LC network functions in Foster and Cauer forms.

8. **Two- Port parameters of Networks [7 hours]**
   Definition of two-port network, Open circuit impedance parameters**,** Short circuit admittance parameters, Transmission parameters and hybrid parameters; Reciprocity and symmetry in two port networks in terms of Z, Y, T and h parameters; Relationship between parameters of two port network; Series-series, Parallel-Parallel, cascade and series-parallel connection of two port networks

Practical: There shall be at least 6 laboratories involving following topics

1. Transient and steady state responses of first order Passive network
2. Transient and Steady state responses of second order Passive network
3. Determination of Z, Y, T and h parameters of two port resistive networks and verify the result by direct calculation.
4. Determination of appropriate parameters of interconnected two port resistive networks and verify the result by direct calculation.

Reference Books:

1. M.E. Van Valkenburg, "Network Analysis", 3rd Edition, Prentice Hall of India
2. K.M. Soni, "Network Analysis and Synthesis". S.K. Kataria & Sons, India
3. G.K. Mithal, "Network Analysis", Khanna Publishers, India

Chapter Wise Marks Distribution for Final Examination

SN	Chapter	Lecture hour	Marks distribution	Types of Questions			Remarks
				Very Short	Short	Long	
1	Chapter 1	4	8	✓	✓	✓	(2Very short+1short) or (2 short) or (1 long)
2	Chapter 2	6	8	✓	✓	✓	(2Very short+1short) or (2 short) or(1 long)
3	Chapter 3	6	8	✓	✓	✓	(2Very short+1short) or (2 short) or (1 long)
4	Chapter 4	4	4	✓	✓	×	(2Very short) or (1 short)
5	Chapter 5	7	8	✓	✓	✓	(2Very short+1short) or (2 short) or (1 long)
6	Chapter 6	4	8	✓	✓	✓	(2Very short+1short (2 short) or (1 long)
7	Chapter 7	7	8	✓	✓	✓	(2Very short+1short) or (2 short)or (1 long)
8	Chapter 8	7	8	✓	✓	✓	(2Very short+1short) or (2 short) or (1 long)
	Total	45	60				

Note: All the questions in very short type must be theoretical questions. There shall be 4 very short questions each carrying 2 marks.

In Short type questions there can't be any breakdown and question can be theoretical or numerical question. There shall be 7 short questions each carrying 4 marks.

In Long type question there can be some breakdown and questions may be numerical/Derivational/ Theoretical. There shall be 3 long questions each carrying 8 marks.

Purbanchal University
Model question 2023

Program: Bachelor in Electrical/ Electronics Communication & Automation Engineering
Semester: III
Subject: BEL---- **Network Analysis**

FM: 60
PM: 24
Time: 3 hours

Attempt all questions

Group-A

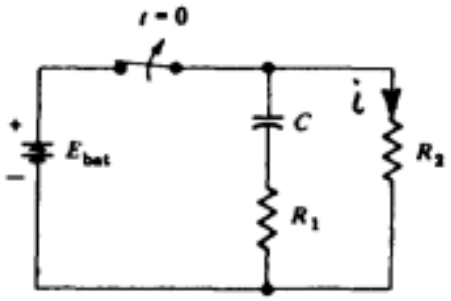
Very Short questions [4×2 = 8]

1. What is transient?
2. Define time constant of RL series circuit.
3. State Initial value theorem.
4. State differentiation and integration properties of Laplace transform.

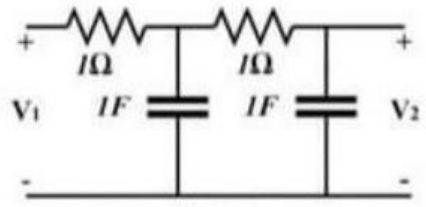
Group-B

Short questions [7×4 = 28]

5. The circuit shown in figure 1c is in steady state condition with E_{bat} = 10 V, C=0.15F, R_1 = 2 ohm and R_2 = 4 ohm. If switch is opened at t=0, determine current in 4-ohm resistance and voltage across capacitance at t =0.



6. Use pole – zero plot to determine residues and hence obtain time response of the given transfer function
$$G(s) = \frac{s(s+5)}{(s+1)(s+3)}$$
7. Determine voltage transfer ratio for the given network. (Chapter 6)



8. Enumerate the properties of positive real function.
9. Synthesize the network function in Cauer I form.

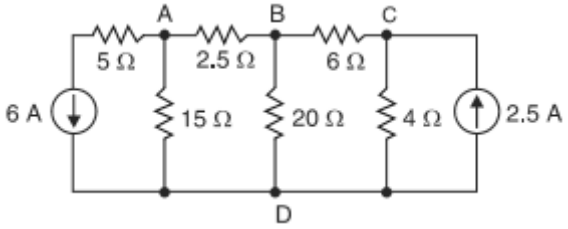
$$Z(s) = \frac{(s+1)(s+4)}{s(s+2)(s+5)}$$

10. Derive the condition for reciprocity of 2 port network in terms of ABCD parameters.
11. The Z parameters of two-port network are Z_{11} = 30 Ω, Z_{12}=15 Ω, Z_{21}=15 Ω and Z_{22}=10 Ω. Calculate the hybrid parameters for the network and hence write the network equation using hybrid parameters.

Group C

Long questions [3×8 = 24]

12. Develop the matrix model using nodal analysis for the network shown in the figure below and hence solve for node voltages using Gauss elimination method.



13. A series RLC circuit with R= 200 Ω, L =0.5 H and C= 100μF has a sinusoidal voltage source of 300 sin (500t+α) volts. Find the resulting current transient if the switch is closed when α= 30^0. Use Laplace transformation method for solving differential equation.

14. A step dc current of 2A is suddenly applied to parallel RLC circuit with C=1F, R=0.5Ω and L = 0.5 H. Obtain the total solution of voltage appearing across capacitor. Assume there is no charge initially on inductor and capacitor.

Detailed Syllabus of Network Analysis

Note: Define(SD), Description(D), Derive(Dr), Illustration(I), Explanation(E), Application(A), Experimental(Ex), Numerical(N)

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Matrix methods in Network Analysis	1.1	Review of Mesh analysis and nodal analysis involving independent and dependent sources	✓	✓		✓	✓			✓	2	
		1.2	Solution of Mesh analysis using Gauss elimination, Gauss Jordan and Cramer's rule	✓	✓		✓				✓		
		1.3	Solution of Nodal analysis using Gauss elimination, Gauss Jordan and Cramer's rule	✓	✓		✓				✓	2	
2	Classical solution of First order differential equations	2.1	Differential operator, operational impedance, Forced and transient solution, formulation of differential equations	✓	✓		✓	✓			✓	1	
		2.2	Initial conditions, procedure to evaluate initial condition, transient and steady state response, zero input response and zero state response	✓	✓			✓			✓	1	
		2.3	Complete Response of first order RL circuit with step, exponential and sinusoidal input, Time constant of RL circuit	✓	✓	✓	✓	✓			✓	2	
		2.4	Complete Response of first order RC circuit with step, exponential and	✓	✓	✓	✓	✓			✓	2	

			sinusoidal input, Time constant of RC circuit										
3.	Classical solution of Second order differential equations	3.1	Formulation of second order differential equation in second order circuit (series or parallel RLC circuit), Nature of solution of homogeneous and non-homogeneous differential equation, General solution for underdamped, critically damped and overdamped second order network	✓	✓			✓				3	
		3.2	Step voltage response of series RLC circuit, step current response of parallel RLC network		✓			✓					
		3.3	Particular integral by the method of undetermined coefficients	✓	✓			✓				3	
		3.4	Complete response of RLC series or parallel circuit with exponential and sinusoidal input	✓	✓			✓					
		3.5	Response of series RLC circuit as related to the S-plane location of roots		✓	✓		✓			✓		
4	Laplace and Inverse Laplace transform	4.1	Definition and properties used for Network Analysis	✓	✓	✓		✓			✓	1	
		4.2	Laplace transform of common forcing functions, step, ramp, impulse and sinusoidal functions, shifted functions	✓	✓	✓		✓			✓	1	
		4.3	Initial value theorem, final value theorem, first and second shifting theorem	✓	✓	✓		✓			✓	1	
		4.4	Use of partial fraction expansion in analysis using Laplace transformation, Heaviside's partial fraction expansion theorem	✓	✓			✓			✓	1	

5	Solution of ordinary differential equations using Laplace transformation technique	5.1	Complete response of series RL circuit to step, exponential and sinusoidal inputs	✓	✓	✓	✓	✓			✓	3	
		5.2	Complete response of series RC circuit to step, exponential and sinusoidal inputs	✓	✓	✓	✓	✓			✓		
		5.3	Complete response of series and parallel RLC networks to step, exponential and sinusoidal inputs	✓	✓	✓	✓	✓			✓	3	
		5.4	Complete response of series and parallel RLC networks to step, exponential and sinusoidal inputs	✓	✓	✓	✓	✓			✓		
		5.5	Laplace transform of some waveforms like staircase, truncated ramp etc. that can be synthesized using step and ramp signals, RL and RC excitation using these waveforms as forcing function	✓	✓	✓	✓	✓			✓	1	
6	Transfer Functions	6.1	Transform impedance and admittance; Network functions for One-port network; Network functions for a two-port network	✓	✓		✓	✓				2	
		6.2	Transfer function- Transform impedance, Transform admittance, driving point impedance, driving point admittance, voltage transfer ratio, current transfer ratio, transfer admittance, transfer impedance	✓	✓	✓	✓	✓			✓		
		6.3	Poles and Zeros plot and analysis; Time-domain behavior from pole-zero locations	✓	✓		✓	✓			✓	2	

		6.4	Stability and Routh's Criteria	✓	✓		✓	✓			✓		
7	One-port Passive Network	7.1	Hurwitz polynomial and properties of Hurwitz polynomial	✓	✓			✓			✓	1	
		7.2	Positive real function, properties of prf	✓	✓			✓			✓		
		7.3	Properties of LC Network function, synthesis of LC network in Foster I, Foster II, Cauer I and Cauer II	✓	✓			✓			✓	2	
		7.4	Properties of RL impedance or RC admittance Network function, synthesis of RL impedance or RC admittance network in Foster I, Foster II, Cauer I and Cauer II	✓	✓			✓			✓	2	
		7.5	Properties of RC impedance or RL admittance Network function, synthesis of RC impedance or RL admittance network in Foster I, Foster II, Cauer I and Cauer II	✓	✓			✓			✓	2	
8	Two-Port Parameters of Networks	8.1	Definition of two-port network, Open circuit impedance parameters, short circuit admittance parameters, Transmission parameters and hybrid parameters	✓	✓	✓		✓			✓	2	
		8.2	Reciprocity in terms of Z, Y, T and h parameters	✓	✓	✓		✓			✓	1	
		8.3	Symmetry in terms of Z,Y,T and h parameters	✓	✓	✓		✓			✓	1	
		8.4	Relationships between parameter sets	✓	✓	✓		✓			✓	2	

		8.5	Series-series, Parallel-Parallel, cascade and series-parallel connection of two port networks	✓	✓	✓		✓			✓	1	

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in **Biomedical/ Electronics Communication & Automation** Engineering

Subject: ELECTRONIC CIRCUITS

Subject Code: BEC----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	30	150
3	3	1	3	7	3 Hrs.	60	-	20			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course Objectives: To introduce students about working principles and applications of electronic circuits

1.0 Amplifiers: **(4 hours)**

1.1 Definition
1.2 Insulated Gate Bipolar Transistors(IGBT)
1.3 Multistage amplifiers, Concept, block diagram
  1.3.1 RC coupled amplifier
  1.3.2 Frequency response of RC coupled amplifier
1.4 Differential amplifier

2.0 Power Amplifier **(6 hours)**

2.1 Class A : definition, efficiency
2.2 Class B : definition, efficiency
2.3 Push pull Amplifier
  2.3.1. Class A: Transformer couple amplifier with efficiency
  2.3.2 Class B: Crossover distortion, efficiency

3.0 Feedback Amplifiers **(3 hrs)**

3.1. Definition and types of feedback (positive and negative)
3.2 Feedback Configurations
3.3 Effect on distortion and noise due to feedback

4.0 Applications of operational amplifiers **(7 hours)**

4.1. Review of Op amp as a subtractor and Op amp as a comparator
4.2. Input offset, Input bias and Input offset current, output impedance
4.3. Common Mode Rejection Ration

4.4. Instrumentation amplifier and its applications
4.5. Isolation amplifier and its applications
4.6. Log antilog amplifier and its applications

5.0 Oscillators (8 hours)

5.1. Mechanism to start oscillation
5.2. Definition, Barkhaussen criteria of oscillation
5.3. Types of oscillator
5.3.1 LC oscillator and its applications (Colpitt's, Hartley oscillator)
5.3.2. RC oscillator and its applications (Wien Bridge, RC phase shift oscillator)
5.3.3. Crystal oscillator and its applications

6.0 Multivibrator (6 hours)

6.1. Definition
6.2. Types of multivibrator
6.2.1. Astable multivibrator and its applications
6.2.2. Monostable multivibrator and its applications
6.2.3. Bistable multivibrator and its applications
6.3. 555 Timer and its applications
6.3.1. 555 Timer as an astable multivibrator
6.3.2. 555 Timer as a monostable multivibrator

7.0. Data conversion (6 hours)

7.1. Digital to analog converters (DAC)
7.1.1. Weighted resistor DAC
7.1.2. R-2R ladder DAC
7.1.3. Comparison between Weighted resistor and R-2R DAC
7.2. Analog to digital converters (ADC)
7.2.1. Successive approximation ADC
7.2.2. Flash ADC
7.2.3. Dual slope ADC
7.2.4. Selection criteria of ADC

8.0. Power supply and voltage regulators (5 hours)

8.1. Unregulated and regulated power supply
8.2. Types of voltage regulators
8.2.1. Linear voltage regulators
8.2.2. Switching voltage regulators (SMPS)
8.3. IC regulator

Note: Final Practical marks is allocated for Group Project works, evaluated by external examiner

Practical:

1. Observe and compare the output of Op-amp in inverting and non-inverting configuration
2. Op-amp(slew rate, input and output offset voltages, comparing output offset voltages with and without compensating resistor)
3. Design a Wienbridge oscillator
4. Design RC phase shift oscillator
5. Astable and monostable multivibrator using 555 timer
6. ADC and DAC

7. SMPS
8. Instrumentation Amplifier

References:

1. Theodorre S. Bogart, "Electronic Devices and Circuits"
2. Robert Boyelstad, " Electronic Devices and Circuits"
3. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press
4. J.B. Gupta, "Electronic Devices and Circuits"

Tentative Marks Distribution:

Chapter	Hours	Marks
1	5	5
2	6	8
3	3	4
4	7	10
5	8	15
6	6	7
7	6	6
8	5	5

Purbanchal University

Model Question 2023

Program: Bachelor in Biomedical/ Electronics, Communication and Automation Engineering

F.M:60 P.M:24
Time: 3:00 hrs

Subject: BEC---- Electronic Circuits

Answer All Questions

Group A **4*2=8**

1. Define operational amplifier with its symbol and pin configuration.
2. Write the applications of op amp.
3. State Barkhaussen criteria of oscillation.
4. Define feedback in amplifiers.

Group B **7*4=28**

5. Explain a 4 bit weighted resistor DAC.
6. Explain 555 timer as a monostable multivibrator.
7. Define isolation amplifier with its applications.
8. A dual slope ADC uses a 16 bit counter and a 4 Mhz clock rate. The maximum input voltage is +10V. The maximum integrator output voltage should be -8V when the counter has cycled through 2^n counts. Capacitor used in the integrator is 0.1µF. Find the value of resistor in the integrator.
9. What are the differences between an amplifier and oscillator? Explain with block diagrams.
10. Explain regulated power supply with block diagram.
11. State the advantages of feedback in amplifiers.

Group C **3*8=24**

12. Explain the operation of Colpitt's oscillator with circuit diagram and frequency of oscillation.
13. Explain class B push pull amplifier with necessary diagrams and waveforms.
14. What is an instrumentation amplifier? Write its applications. Derive the equation for gain for 3 op amp instrumentation amplifier.

ELECTRONIC CIRCUITS (BE Electronics, Communication and Automation/Biomedical)

Year: II **Semester: III**

Teaching Hours/week				Examination Scheme						Total Marks
				Internal		Final				
				Theory	Practical	Theory		Practical		
Cr	L	T	P			Duration	Marks	Duration	Marks	
3	3	1	3	40	30	3	60	3	20	150

Course Objectives: To introduce students about working principles and applications of electronic circuits

Detailed Course Contents:

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	**Introduction**	1.1	Definition	✓								**4**	
		1.2	Insulated Gate Bipolar Transistors(IGBT)		✓		✓	✓					
		1.3	Multistage amplifiers, Concept, block diagram: RC coupled amplifier, frequency response of RC coupled amplifier	✓	✓	✓					✓		
		1.4	Differential amplifier	✓	✓		✓	✓					
2	**Power Amplifier**	2.1	Class A: definition, efficiency	✓		✓	✓	✓				**6**	
		2.2	Class B: definition, efficiency	✓		✓	✓	✓					
		2.3	Push pull Amplifier (Class A: Transformer couple amplifier with efficiency, Class B: Crossover distortion, efficiency)	✓		✓	✓	✓			✓		
3	**Feedback Amplifiers**	3.1	Definition and types of feedback (positive and negative)	✓	✓	✓	✓	✓			✓	**3**	
		3.2	Feedback Configurations	✓	✓		✓						

		3.3	Effect on distortion and noise due to feedback	✓	✓	✓	✓						
4	**Applications of operational amplifiers**	4.1	Review of Op amp as a subtractor and Op amp as a comparator	✓								**7**	
		4.2	Input offset, Input bias and Input offset current, output impedance	✓									
		4.3	Common Mode Rejection Ratio	✓							✓		
		4.4	Instrumentation amplifier and its applications		✓	✓	✓		✓				
		4.5	Isolation amplifier and its applications		✓	✓	✓		✓				
		4.6	Log antilog amplifier and its applications		✓	✓	✓		✓				
5	**Oscillators**	5.1	Mechanism to start oscillation	✓			✓	✓				**8**	
		5.2	Definition, Barkhaussen criteria of oscillation	✓			✓	✓					
		5.3	Types of oscillator: LC oscillator and its applications (Colpitt's, Hartley oscillator), RC oscillator and its applications (Wien Bridge, RC phase shift oscillator), Crystal oscillator and its applications	✓		✓	✓	✓	✓		✓		
6	**Multivibrator**	6.1	Definition	✓								**6**	
		6.2	Types of multivibrator: Astable, Monostable ,multivibrator, Bistable and its applications	✓	✓	✓	✓	✓	✓		✓		
		6.3	555 Timer and its applications: 555 Timer as an astable and monostable multivibrator	✓	✓	✓	✓	✓	✓		✓		
7	**Data conversion**	7.1	Digital to analog converters (DAC): Weighted resistor DAC, R-2R ladder DAC, Comparison between Weighted resistor and R-2R DAC	✓	✓	✓	✓	✓	✓		✓	**6**	
		7.2	Analog to digital converters (ADC): Successive approximation ADC, Flash ADC, Dual slope ADC, Selection criteria of ADC	✓	✓	✓	✓	✓	✓		✓		
8	**Power supply and voltage regulators**	8.1	Unregulated and regulated power supply	✓	✓	✓	✓	✓	✓		✓	**5**	
		8.2	Types of voltage regulators: Linear voltage regulators, Switching voltage regulators (SMPS)	✓	✓	✓	✓	✓	✓		✓		
		8.3	IC regulator	✓	✓	✓	✓	✓	✓				

Note: Define(SD), Description (D), Derive (Dr), Illustration (I), Explanation (E), Application (A), Experimentation (Ex), Numerical (N)

Practical (Laboratory works):

1. Observe and compare the output of Op-amp in inverting and non-inverting configuration
2. Op-amp(slew rate, input and output offset voltages, comparing output offset voltages with and without compensating resistor)
3. Design a Wienbridge oscillator
4. Design RC phase shift oscillator
5. Astable and monostable multivibrator using 555 timer
6. ADC and DAC
7. SMPS
8. Instrumentation Amplifier

References:

1. Theodorre S. Bogart, "Electronic Devices and Circuits"
2. Robert Boyelstad, " Electronic Devices and Circuits"
3. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press
4. J.B. Gupta, "Electronic Devices and Circuits"

Marks Distribution:

Chapter	Hours	Marks
1.	5	5
2	6	8
3	3	4
4	7	10
5	8	15
6	6	7
7	6	6
8	5	5

Evaluation Scheme;

Marks Division

Question Type	No. of Questions	Marks	Total Marks
Short	4	2	8
Medium	7	4	28
Long	3	8	24
Total			60

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Biomedical/ Electrical/ Electronics Communication & Automation Engineering

Subject: MICROPROCESSOR

Subject Code: BEC----

Year: II **Semester: III**

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	50	150
3	3	1	3	7	3 Hrs.	60	-	-			

Note: **L:** Lecture **T:** Tutorial **P:** Practical

Course Objectives: The objective of this course is to provide fundamental knowledge to understand the operation, programming and application of 8085 and 8086 microprocessor.

1. Introduction to microprocessor **(4 hours)**

1.1 Evolution of microprocessor
1.2 Microcomputer System with bus organization
1.3 Comparison among CPU, microprocessor and microcontroller
1.4 Application of microprocessors

2. Intel 8085 Microprocessor **(12 hours)**

2.1 Internal Architecture
2.2 Pin diagram and pin function
2.3 Addressing modes
2.4 Instruction Set
2.5 Instruction and machine cycle
2.6 Timing diagram for opcode fetch, memory read and write and I/O read and write
2.7 Assembly language programs of 8085, macro assembler, assembler directives and subroutine
2.8 Time delay and counter design

3. Intel 8086 Microprocessor (12 hours)

3.1 Internal Architecture
3.2 Memory segmentation
3.3 Addressing modes
3.4 Instruction Set
3.5 Fetch-execution overlap
3.6 Assembly language programs of 8086

4. Memory Interface (3 hours)

4.1 SRAM and ROM interface requirements
4.2 Address Decoding
4.3 Memory Interfacing with 8085

5. Input/output Interfaces: (9 hours)

5.1 Serial communication
5.2 Parallel communication
5.3 Programmable Peripheral Interface 8255: block diagram and mode of initialization
5.1 RS-232C standard
5.2 Programmable Communication Interface 8251: block diagram

6. Interrupt: (5 hours)

6.1 Basic Interrupt processing
6.2 Types of interrupt
6.3 Interrupt priority: polled and chained interrupt
6.4 DMA: block diagram and Timing diagram

Laboratory

1. Familiarization with 8085 microprocessor trainer kit and simulator
2. Data transfer instructions
3. Arithmetic and logical instructions
4. Subroutine and branching instructions
5. Stack operations
6. Timers and delay
7. Code conversion
8. Familiarization with assembly language program, assembling and macro assembler (MASM)
9. Operations related to data transfer, arithmetic and logical instruction in 8086
10. Operation related to case conversion (Upper case to lower case and vice-versa)

References:

1. Ramesh S. Gaonkar, ”Microprocessor – Architecture, Programming & Applications with the 8085”, Penram International Publisher, 5th Ed., 2006
2. Douglas V. Hall, “Microprocessors & Interfacing: Programming & Hardware”, 2nd Ed., Tata McGraw Hill, 2006
3. Ghosh, P. K., Sridhar P. R.,"*0000 to 8085: Introduction to Microprocessors for Engineers and Scientists*", Second Edition, Prentice Hall of India Private Limited, 1997.
4. " Lance, A. Leventhal., "*Introduction to Microprocessors: Software, Hardware, and Programming*”, Eastern Economy Edition, Prentice Hall of India Private Limited, 1995.
5. Malvino, A. P., "*An Introduction to Microcomputers*", Prentice Hall of India Private Limited, 1995.

Detailed Syllabus of **Microprocessor:**

Note: Define(SD), Description (D), Derive (Dr), Illustration (I), Explanation (E), Application (A), Experimentation (Ex), Numerical (N)

Detailed Course Contents:

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				SD	D	DR	I	E	A	EX	N		
1	Introduction	1.1	Evolution of microprocessor		✓							4	
		1.2	Microcomputer System with bus organization				✓	✓					
		1.3	Comparison among CPU, microprocessor and microcontroller				✓	✓					
		1.4	Application of microprocessors						✓				
2	Intel 8085 Microprocessor	2.1	Internal Architecture				✓	✓				12	
		2.2	Pin diagram and pin function				✓	✓					
		2.3	Addressing modes				✓	✓					
		2.4	Instruction Set				✓	✓					

		2.5	Instruction and machine cycle				✓	✓					
		2.6	Timing diagram for opcode fetch, memory read and write and I/O read and write		✓		✓	✓					
		2.7	Assembly language programs of 8085, macro assembler, assembler directives and subroutine				✓	✓					
		2.8	Time delay and counter design				✓	✓					
3	Intel 8086 Microprocessor	3.1	Internal Architecture				✓	✓				**12**	
		3.2	Memory segmentation		✓								
		3.3	Addressing modes		✓		✓	✓					
		3.4	Instruction Set		✓		✓	✓					
		3.5	Fetch-execution overlap		✓		✓	✓					
		3.6	Assembly language programs of 8086				✓	✓					
4	Memory Interface	4.1	SRAM and ROM interface requirements				✓	✓				**3**	
		4.2	Address Decoding				✓	✓					
		4.3	Memory Interfacing with 8085				✓	✓					

5	Input/output Interfaces	5.1	Serial communication		✓		✓	✓				**9**	
		5.2	Parallel communication		✓		✓	✓					
		5.3	Programmable Peripheral Interface 8255: block diagram and mode of initialization				✓	✓					
		5.4	RS-232C standard		✓		✓	✓					
		5.5	Programmable Communication Interface 8251: block diagram				✓	✓					
6	Interrupt	6.1	Basic Interrupt processing		✓							**5**	
		6.2	Types of interrupt		✓		✓	✓					
		6.3	Interrupt priority: polled and chained interrupt		✓		✓	✓					
		6.4	DMA: block diagram and Timing diagram				✓	✓					
Note: Define(SD), Description (D), Derive (Dr), Illustration (I), Explanation (E), Application (A), Experimentation (Ex), Numerical (N)													

Laboratory

1. Familiarization with 8085 microprocessor trainer kit and simulator
2. Data transfer instructions
3. Arithmetic and logical instructions
4. Subroutine and branching instructions
5. Stack operations
6. Timers and delay
7. Code conversion
8. Familiarization with assembly language program, assembling and macro assembler (MASM)

9. Operations related to data transfer, arithmetic and logical instruction in 8086
10. Operation related to case conversion (Upper case to lower case and vice-versa)

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2. Douglas V. Hall, "Microprocessors & Interfacing: Programming & Hardware", 2nd Ed., Tata McGraw Hill, 2006
3. Ghosh, P. K., Sridhar P. R.,"*0000 to 8085: Introduction to Microprocessors for Engineers and Scientists*", Second Edition, Prentice Hall of India Private Limited, 1997.
4. " Lance, A. Leventhal., "*Introduction to Microprocessors: Software, Hardware, and Programming*", Eastern Economy Edition, Prentice Hall of India Private Limited, 1995.
5. Malvino, A. P., "*An Introduction to Microcomputers*", Prentice Hall of India Private Limited, 1995.

Final Examination Scheme:

Chapters	Marks	Remarks
1	4	
2	18	
3	14	
4	4	
5	12	
6	8	
Total	60	

Note: There might be minor deviation in mark distribution.
Mandatory: Marks should be evaluated based on solving steps.

Evaluation Scheme;
Marks Division

Question Type	No. of Questions	Marks	Total Marks
Short	4	2	8
Medium	7	4	28
Long	3	8	24
Total			60

Purbanchal University
Model question 2023

Program: Bachelor in Biomedical/ Electrical/ Electronics Communication & Automation Engineering
Semester: III
Subject: BEC---- Microprocessor

FM: 60
PM: 24
Time: 3 hours

Attempt all questions.

Group A [2X4=8]

1. "Microprocessor is commonly known as CPU", justify the statement. Also if the microprocessor is of 8 bits, what does it specify? [2]
2. What are the general characteristics of microprocessor? Explain in brief. [2]
3. What is I/0 interface? Why it is needed? [2]
4. Differentiate between Register based and accumulator based microprocessor. [2}

Group B [4X7=28]

1. What do you mean by flag register in 8085A microprocessor? Explain in brief with example. [1+3]
2. Draw a timing diagram for the instruction MVI M, 11H such that the instruction is in the location BFFFH and the op-code as 67H. [4]
3. WAP in 8085 for 10ms of delay. [4]
4. What is addressing modes? Also explain any six addressing modes of 8086 microprocessor in brief. [1+3]

5. Interface a 4KB ROM and two 8KB RAM memory chip with 8085 microprocessor. Also illustrate the address range of the chip. [4]
6. What happen when microprocessor is interrupted? Classify the interrupt on the basis of priority. [1+3]
7. Differentiate between maskable and non-maskable interrupt. [4]

Group C [8X3=24]

1. WAP in 8085 to provide the given on/off time to three traffic lights (Green, Yellow and Red) and two pedestrian signs (WALK and DON'T WALK). The signal lights and signs are turned on/off by the data bits of an output port as shown below.

S.N	Lights	Data Bits	On Time
1	Green	D0	15seconds
2	Yellow	D2	5 seconds
3	Red	D4	20 seconds
4	WALK	D6	15 seconds
5	DON'T WALK	D7	25 seconds

The traffic and pedestrian flow are in the same direction, the pedestrian should cross the road when the green light is on. [8]

OR

Write a program in 8086 that will display the string "electronics in purbanchal university".Also display each word in next line in uppercase. [8]

2. Write a block diagram of 8255 PPI. Also explain the function of each block in brief along with control word. [8]

3. Draw the internal architecture of 8086 microprocessor. Explain about its two units along with general registers and PSW. [8]

OR

Write a program in 8086 that will display the string “ExerCise”. Also count the number of vowels and store it at variable count. [8]

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Syllabus

Level: Bachelor

Program: Bachelor in Electronics Communication & Automation Engineering

Subject: DATABASE MNAGEMENGT SYSTEM

Subject Code: BCE----

Year-II **Semester**-III

Teaching Schedule Hours/Week					Examination Schedule						Total Marks
					Final				Internal Assessment		
					Theory		Practical		Theory Marks	Practical Marks	
Credit Hours	L	T	P	Total	Duration	Marks	Duration	Marks	40	30	125
3	3	1	3	7	3 Hrs.	60	-	25			

Note: **L:** Lecturer **T:** Tutorial **P:** Practical

Course Objective: This course introduces the fundamental concept, theory and practices in design of database and implementation of database management system. It provides a thorough understanding of the fundamentals of database management system to a student so that he/she will be able to code, compile and test backend query as well as to take up Systems programming or Advanced database programming course.

Chapter	Course Contents	Lecture Hours
1	**Introduction** 1.1 Data, Database and DBMS 1.1.1 Objectives of Database 1.1.2 Benefits and difficulties of DBMS 1.2 Needs of DBMS for engineering and organization 1.3 Major features of DBMS 1.3.1 Data abstraction, Data Independence and Data consistency 1.4 Schema and Instances 1.4.1 Database schema and instance 1.4.2 Table/relation schema and instance 1.5 Three schema Approach of DBMS 1.6 Database administration and Users 1.7 DBMS Languages 1.7.1 Data definition language (DDL) 1.7.2 Data manipulation language (DML)	5 hrs.

	1.7.3 Data control language (DCL) 1.7.4 Transaction control language(TCL)	
2	**Data Models** 2.1 Introduction and importance of data models 2.2 Conceptual, Logical and Physical model 2.3 Hierarchical, Network and Relational Data Models 2.4 Object-based model, Entity Relationship Model(ER Model) 2.5 ER-diagram 2.5.1 Components of ER diagram 2.5.2 Role of ER diagram 2.5.3 Entity Relationship diagram Methodology 2.5.3.1 Examples of ER-diagram 2.6 Converting ER model into relational model 2.5.1 Rules and examples 2.7 Business rule to design data models 2.7.1 Discovering business rules 2.7.2 Translating business rules into Data model components (rules) 2.7.3 Naming convention	4 hrs.
3	**Relational Model** 3.1 Definitions and terminology 3.2 Structure of Relational databases 3.3 Relational Algebra 3.3.1 Relational algebra operations 3.3.1.1 Unary operations (select, project, rename) 3.3.1.2 Binary (Union, Set-intersection, Set-difference, Division, Cartesian product, Join) 3.3.1.3 Others (Assignment, Deletion, Insertion, Update) 3.4 Relational Calculus 3.4.1 TRC (Tuple oriented relational calculus) 3.4.1.1 Introduction with basic examples 3.4.2 DRC (Domain oriented relational calculus) 3.4.2.1 Introduction with basic examples 3.5 Pitfalls of relational Model	5 hrs.
4	**Structured Query Language (SQL)** 4.1 Introduction 4.1.1 Overview with major features 4.2 DDL (create, alter, drop, truncate) 4.2.1 Introduction and practical implementation of each command 4.3 DML (insert, delete, update, select) 4.3.1 Introduction and practical implementation of each command 4.4 TCL (commit, rollback, save point) 4.4.1 Introduction and practical implementation of each command 4.5 DCL (grant, revoke) 4.5.1 Introduction and practical implementation of each command 4.6 Aggregate Queries 4.6.1 Introduction and practical implementation of each command 4.7 Set operations and joins 4.7.1 Introduction and practical implementation of each command 4.8 Triggers and Views 4.8.1 Introduction and practical implementation of each command 4.8.2 Benefits of triggers in DBMS	6 hrs.

5	**Relational Database Design and Normalization** 5.1 Overview 5.1.1 Introduction 5.1.2 Keys in DBMS 5.2 Relational Constraints 5.2.1 Domain constraint, Key Integrity (Primary key), Referential Integrity (Foreign key), Not null constraints, Check constraints, Unique constraints 5.3 Functional dependency 5.3.1 Introduction 5.3.2 Types functional dependency (Full, Partial, Trivial, Non-trivial, Multi-value, Join) 5.4 Inference rules for functional dependency 5.5 Decomposition of Relation 5.5.1 Dependency preserving decomposition 5.6 Closure Set of Functional Dependency and attributes 5.7 Normalization, Role of Normalization 5.8 Normal forms (1 NF, 2NF, 3NF, BCNF) 5.9 Comparative study of all normal forms	8 hrs.
6	**Database Security** 6.1 Introduction 6.1.1 Importance of database security 6.2 Different levels of security 6.3 Database security services: Confidentiality, Authentication, Authorization, Integrity, Availability, Non-Repudiation 6.4 Access control 6.4.1 Introduction with access control matrix 6.4.2 Types: Discretionary, Mandatory, Role-base, Rule-base 6.5 Encryption and Decryption 6.5.1 Introduction with basic example	2 hrs.
7	**Query Processing** 7.1 Introduction to Query Processing 7.2 Query Cost 7.3 Representing Queries using query tree and query graph 7.3.1 Introduction with examples 7.4 Query Decomposition 7.4.1 Introduction 7.4.2 Stages of query decomposition 7.4.3 Basic examples 7.5 Query optimization 7.5.1 Introduction	2 hrs.
8	**Filing and File System** 8.1 Storage devices 8.1.1 Storage device hierarchy 8.2 Buffer Management 8.2.1 Introduction with buffer pool 8.3 File Organization 8.3.1 Introduction 8.3.2 Types: 8.3.2.1 Sequential (Pile file and Sorted file) 8.3.2.2 Indexed sequential (Primary indexed file and Secondary indexed file)	3 hrs.

	8.3.2.3 Hashed file 8.4 Hash Collision: 8.4.1 Introduction 8.4.2 Hash collision detection 8.4.2.1 Introduction 8.4.3 Hash collision Resolution 8.4.3.1 Introduction 8.5 Data Dictionary Storage 8.5.1 Introduction	
9	**Concurrency Control** 9.1 Introduction 9.1.1 Database transaction, ACID properties and states 9.1.2 Needs of Concurrency Control 9.1.2.1 Lost update problem 9.1.2.2 Dirty read problem 9.1.2.3 Incorrect summary problem 9.2 Scheduling 9.2.1 Introduction and types 9.3 Concurrency Control Techniques : Lock based, Two-phase locking and Time-stamp based protocols 9.4 Deadlock Handling 9.4.1 Deadlock detection 9.4.2 Deadlock prevention (Wait-die scheme, Wound-wait scheme)	5 hrs.
10	**Database Recovery** 10.1 Introduction 10.1.1 Importance of database recovery 10.2 Failure Classification 10.3 Log based recovery: 10.3.1 Deferred update (In Single/Multi User Environment) 10.3.2 Immediate update (In Single/Multi User Environment) 10.4 Write Ahead Logging Protocol 10.4.1 Introduction with basic example 10.5 Shadow paging 10.5.1 Introduction with basic example 10.6 Backup 10.6.1 Introduction 10.6.2 Backup techniques (Full database backup, differential backup and transaction log backup) 10.7 Dumping 10.7.1 Introduction with basic example	3 hrs.
11	**Advanced Database Models** 11.1 Distributed Model 11.1.1 Introduction with characteristics and applications 11.1.2 Types (Homogeneous and Heterogeneous) 11.2 Multimedia Model 11.2.1 Introduction with features, application and example 11.3 ORDBMS (Object Relational Database Management Systems) 11.3.1 Introduction with major characteristics	2 hrs.

	11.3.2 Examples with application	
	Total:	45 Hrs.

Assignments:

Assignment should be given for each chapter.

Laboratory Work:

There shall be lab exercises covering concepts mentioned in syllabus of Database Management System with SQL.

Marks Distribution:

Chapters	Tentative marks Distribution
Chapter 1	4+2
Chapter 2	4
Chapter 3	4+2
Chapter 4	8+2
Chapter 5	8
Chapter 6	4
Chapter 7	2
Chapter 8	4
Chapter 9	8
Chapter 10	4
Chapter 11	4
Total	60

Remarks: There may be minor marks deviation in marks distribution.

Text Books:

1. Database Management System (DBMS) A Practical Approach by **Rajiv Chopra**
2. Concepts of Database Management 9th Edition by **Joy L. Starks** (Author), **Philip J. Pratt** (Author), **Mary Z. Last** (Author)
3. *SQL: The Complete Reference, Third Edition* by Bradley Nice

PURBANCHAL UNIVERSITY
Model Question 2023

Program: Bachelor of Engineering in Electronics Communication and Automation/ Final

Full Marks: 60
Pass Marks: 24
Time: 3:00 hrs.

Subject: BCE---- Database Management System

Group-A Answer all Questions [4*2=8]

1. Define instance with example.
2. What are the major terminologies of relational database model?
3. What is query cost?
4. What are the benefits of triggers in DBMS?

Group-B Answer any Seven Questions [7*4=28]

5. Explain three schema approaches.
6. Discuss the application of DBMS in engineering field.
7. Consider the following relations with primary keys underlined
   Customer (c_id, c_name, c_address)
   Branch (b_name, b_city, assets)
   Account (c_id, act_no, b_name, balance)
   Write the relational algebra for the following:
   a. Find the name of customer, who is involved in branch computer.
   b. Find the branch_name and branch_city who have assets greater than Rs.50,000.
8. Differentiate between Discretionary and Mandatory access control.
9. What are different file organizations? Explain two of them.
10. Explain shadow paging with suitable example.
11. Explain distributed database model with its major features.
12. Explain query processing in detail.

Group- C Answer any Three Questions [3*8=24]

13. What are the benefits of normalization in relational database design? Explain 3NF, 4NF and 5NF with suitable example.[2+6]

14. Define database transaction. Explain concurrency control techniques in detail. [2+6]

15. Define view. Draw ER-diagram for library management system and convert in relational model. [2+6]

16. Consider the following two tables:

Student

Roll_No	**S_name**	**S_Contact**	**S_address**	**M_Id**
101	Sajan	9846723457	Kathmandu	1
102	Raj	9845678223	Lalitpur	2
103	Rohan	9813556677	Bhaktapur	3

Marks

Marks_Id	**DBMS**	**FOSP**	**Math**
1	89	87	65
2	77	67	80
3	88	65	85

Now answer the following question: 2*4=8

a) Write SQL query to find student name and DBMS marks that scores maximum marks in DBMS.
b) Write SQL query to display all information of students, whose address are arranged in descending order.
c) Write SQL query to increment FOSP marks by 13% who is from Lalitpur.
d) Write SQL to delete details of student whose name starts with 'S'.

Purbanchal University

Faculty of Engineering, Biratnagar, Nepal

Detailed Syllabus

Level: Bachelor Year: II Semester: III

Program: Bachelor in Electronics Communication & Automation **Engineering**

Subject: DATABASE MNAGEMENGT SYSTEM

Subject Code: BCE----

Note: Define(D), Description(Des), Derive (DR), Design(DSG), Illustration (I), Algorithm(Alg), Application (A), Experiment[Program (P)/Hardware(H)], Numerical (N)

Detailed Course Contents of Database Management System:

Ch No.	Topic		Subtopic	Depth								Hour	Remarks
				D	Des	DR/DSG	I	Alg	H/P	A	N		
1	**Introduction**	1.1	Data, Database and DBMS 1.1.1 Objectives of Database 1.1.2 Benefits and difficulties of DBMS	**D**						**A**		**5 hrs.**	
		1.2	Needs of DBMS for engineering and organization		**Des**					**A**			
		1.3	Major features of DBMS 1.3.1 Data abstraction, Data Independence and Data consistency		**Des**		**I**						

		1.4	Schema and Instances 1.4.1 Database schema and instance 1.4.2 Table/relation schema and instance		**Des**	**DSG**							
		1.5	Three schema Approach of DBMS		**Des**	**DSG**							
		1.6	Database administration and Users		**Des**								
		1.7	DBMS Languages	**D**									
			1.7.1 Data definition language (DDL)		**Des**		**I**						
			1.7.2 Data manipulation language (DML)		**Des**		**I**						
			1.7.3 Data control language (DCL)		**Des**		**I**						
			1.7.4 Transaction control language(TCL)		**Des**		**I**						
2	**Data Models**	2.1	Introduction and importance of data models	**D**			I					**4 hrs.**	
		2.2	Conceptual, Logical and Physical model		**Des**		I						
		2.3	Hierarchical, Network and Relational Data Models		Des		**I**						
		2.5	ER-diagram	**D**			**I**						
			2.5.1 Components of ER diagram		**Des**	DSG	**I**						
			2.5.2 Role of ER diagram	**D**			**I**						

			2.5.3Entity Relationship diagram Methodology 2.5.3.1 Examples of ER-diagram		Des	**DSG**	I						
		2.6	Converting ER model into relational model 2.6.1 Rules and examples		Des	**DSG**	I						
		2.7	Business rule to design data models	D			I						
			2.7.1 Discovering business rules		Des					A			
			2.7.2 Translating business rules into Data model components (rules)		Des		I						
			2.7.3 Naming convention	D		**DSG**	I						
3	**Relational Model**	**3.1**	Definitions and terminology	**D**						A		**5 hrs.**	
		3.2	Structure of Relational databases		**Des**		I			A			
		3.3	Relational Algebra		**Des**		I						
			3.3.1 Relational algebra operations		**Des**		I		P				
			3.3.1.1 Unary operations (select, project, rename)		**Des**		I		P				
			3.3.1.2 Binary (Union, Set-intersection, Set-difference, Division, Cartesian		**Des**		I		P				

			product, Join)										
			3.3.1.3 Others (Assignment, Deletion, Insertion, Update)		**Des**		I		P				
		3.4	Relational Calculus										
			3.4.1 TRC (Tuple oriented relational calculus)	**D**						A			
			3.4.1.1 Introduction with basic examples		**Des**		I		P				
			3.4.2 DRC (Domain oriented relational calculus)	**D**			**I**						
			3.4.2.1 Introduction with basic examples		**Des**		I		P				
		3.5	Pitfalls of relational Model		**Des**								
4	**Structured Query Language (SQL)**	4.1	Introduction	**D**								**6 hrs.**	
			4.1.1 Overview with major features	**D**						A			
		4.2	DDL (create, alter, drop, truncate)	**D**						A			
			4.2.1 Introduction and practical implementation of each command		Des				P				
		4.3	DML (insert, delete, update, select)	**D**						A			
			4.3.1 Introduction and practical		Des				P				

			implementation of each command										
		4.4	TCL (commit, rollback, save point)	**D**						A			
			4.4.1 Introduction and practical implementation of each command		Des				P				
		4.5	DCL (grant, revoke)	**D**						A			
			4.5.1 Introduction and practical implementation of each command		Des				P				
		4.6	Aggregate Queries	**D**						A			
			4.6.1 Introduction and practical implementation of each command		Des				P				
		4.7	Set operations and joins	**D**									
			4.7.1 Introduction and practical implementation of each command		Des				P				
		4.8	Triggers and Views	**D**						A			
			4.8.1 Introduction and practical implementation of each command		Des				P				
			4.8.2 Benefits of triggers in DBMS	**D**			**I**						
5	**Relational Database Design and Normalization**	5.1	Overview	**D**						A		**8 hrs.**	
			5.1.1 Introduction	**D**									
			5.1.2 Keys in DBMS		Des		**I**						
		5.2	Relational Constraints	**D**						A			
			5.2.1 Domain constraint, Key Integrity (Primary key), Referential Integrity (Foreign key), Not null constraints, Check constraints, Unique constraints		Des		**I**						
		5.3	Functional dependency										

			5.3.1 Introduction	**D**									
			5.3.2 Types functional dependency (Full, Partial, Trivial, Non-trivial, Multi-value, Join)		Des		**I**						
		5.4	Inference rules for functional dependency		Des		**I**						
		5.5	Decomposition of Relation		Des		**I**						
			5.5.1 Dependency preserving decomposition		Des		**I**						
		5.6	Closure Set of Functional Dependency and attributes		Des		**I**						
		5.7	Normalization, Role of Normalization	**D**									
		5.8	Normal forms (1 NF, 2NF, 3NF, BCNF)		Des	DSG							
		5.9	Comparative study of all normal forms		Des					A			
6	**Database Security**	6.1	Introduction	**D**									
			6.1.1 Importance of database security	**D**						A			
		6.2	Different levels of security		Des		**I**						
		6.3	Database security services: Confidentiality, Authentication, Authorization, Integrity, Availability, Non-Repudiation		Des		**I**					**2 hrs.**	
		6.4	Access control	**D**									
			6.4.1 Introduction with access control matrix	**D**			**I**						
			6.4.2 Types: Discretionary, Mandatory, Role-base, Rule-base		Des					A			
		6.5	Encryption and Decryption	**D**			**I**						
			6.5.1 Introduction with basic example	**D**			**I**						
7	**Query**	7.1	Introduction to Query Processing	**D**			**I**					**2 hrs.**	

	Processing	7.2	Query Cost		Des		**I**						
		7.3	Representing Queries using query tree and query graph	**D**			**I**						
			7.3.1 Introduction with examples		Des	DSG							
		7.4	Query Decomposition										
			7.4.1 Introduction	**D**									
			7.4.2 Stages of query decomposition		Des		**I**						
			7.4.3 Basic examples	**D**			**I**						
		7.5	Query optimization 7.5.1 Introduction with basic example		Des		**I**						
8	**Filing and File System**	8.1	Storage devices	**D**								**3 hrs.**	
			8.1.1 Storage device hierarchy		Des								
		8.2	Buffer Management	**D**									
			8.2.1 Introduction with buffer pool		Des		**I**						
		8.3	File Organization										
			8.3.1 Introduction	**D**			**I**						
			8.3.2 Types:	**D**									
			8.3.2.1 Sequential (Pile file and Sorted file)		Des		**I**						
			8.3.2.2 Indexed sequential (Primary indexed file and Secondary indexed file)		Des		**I**						
			8.3.2.3 Hashed file		Des		**I**						
		8.4	Hash Collision:										
			8.4.1 Introduction	**D**									

			8.4.2 Hash collision detection		Des								
			8.4.2.1 Introduction	**D**									
			8.4.3 Hash collision Resolution										
			8.4.3.1 Introduction		Des		**I**						
		8.5	Data Dictionary Storage										
			8.5.1 Introduction	**D**									
9	**Concurrency Control**	9.1	Introduction	**D**								**5 hrs.**	
			9.1.1 Database transaction, ACID properties and states		Des		**I**						
			9.1.2 Needs of Concurrency Control		Des		**I**						
			9.1.2.1 Lost update problem		Des	DSG							
			9.1.2.2 Dirty read problem		Des	DSG							
			9.1.2.3 Incorrect summary problem		Des	DSG							
		9.2	Scheduling										
			9.2.1 Introduction and types	**D**			**I**						
		9.3	Concurrency Control Techniques : Lock based, Two-phase locking and Time-stamp based protocols		Des	DSG	**I**						
		9.4	Deadlock Handling 9.4.1 Deadlock detection		Des		**I**						
			9.4.2 Deadlock prevention (Wait-die scheme, Wound-wait scheme)		Des		**I**						
10	**Database**	10.1	Introduction									**3 hrs.**	

	Recovery		10.1.1 Importance of database recovery	**D**			**I**						
		10.2	Failure Classification		Des		**I**						
		10.3	Log based recovery:										
			10.3.1 Deferred update (In Single/Multi User Environment)		Des		**I**						
			10.3.2 Immediate update (In Single/Multi User Environment)		Des		**I**						
		10.4	Write Ahead Logging Protocol										
			10.4.1 Introduction with basic example		Des		**I**						
		10.5	Shadow paging				**I**						
			10.5.1 Introduction with basic example		Des		**I**						
		10.6	Backup										
			10.6.1 Introduction	**D**						A			
			10.6.2 Backup techniques (Full database backup, differential backup and transaction log backup)		Des		**I**						
		10.7	Dumping										
			10.7.1 Introduction with basic example		Des		**I**						
11	**Advanced Database Models**	11.1	Distributed Model									**2 hrs.**	
			11.1.1 Introduction with characteristics and applications		Des		**I**			A			
			11.1.2 Types (Homogeneous and Heterogeneous)		Des		**I**						
		11.2	Multimedia Model										
			11.2.1 Introduction with features, application and example		Des		**I**			A			

		11.3	ORDBMS (Object Relational Database Management Systems)										
			11.3.1 Introduction with major characteristics		Des					A			
			11.3.2 Examples with application	**D**			**I**						
				Total:								**45 hrs.**	

Assignments:

Assignment should be given for each chapter.

Laboratory Work:

There shall be lab exercises covering concepts mentioned in syllabus of Database Management System with SQL.

Marks Distribution:

Chapters	Tentative marks Distribution
Chapter 1	4+2
Chapter 2	4
Chapter 3	4+2
Chapter 4	8+2
Chapter 5	8
Chapter 6	4
Chapter 7	2
Chapter 8	4
Chapter 9	8
Chapter 10	4
Chapter 11	4
Total	60

Remarks: There may be minor marks deviation in marks distribution.

Text Books:

1. Database Management System (DBMS) A Practical Approach by **Rajiv Chopra**
2. Management by Network Analysis, A Bhattacharya and SK Sorkhel, The Institution of Engineers, India.
3. Concepts of Database Management 9th Edition by **Joy L. Starks** (Author), **Philip J. Pratt** (Author), **Mary Z. Last** (Author)
4. *SQL: The Complete Reference, Third Edition* by Bradley Nice

Model Question
PURBANCHAL UNIVERSITY

B.E Computer/Fourth Semester/ Final
Time: 3:00 hrs. Full Marks: 60/Pass Marks: 24
BEG…: Database Management System

Very short (4*2=8)

1. Define instance with example.
2. What are the major terminologies of relational database model?

3. What is query cost?
4. What are the benefits of triggers in DBMS?

Short (7*4=28)

Attempt any **SEVEN**.

1. Explain three schema approaches.
2. Discuss the application of DBMS in engineering field.
3. Consider the following relations with primary keys underlined
   Customer (c_id, c_name, c_address)
   Branch (b_name, b_city, assets)
   Account (c_id, act_no, b_name, balance)
   Write the relational algebra for the following:
   a. Find the name of customer, who is involved in branch computer.
   b. Find the branch_name and branch_city who have assets greater than Rs.50,000.
4. Differentiate between Discretionary and Mandatory access control.
5. What are different file organizations? Explain two of them.
6. Explain shadow paging with suitable example.
7. Explain distributed database model with its major features.
8. Explain query processing in detail.

Long (8*3=24)

Attempt any **THREE**.

1. What are the benefits of normalization in relational database design? Explain 3NF, 4NF and 5NF with suitable example.[2+6]

2. Define database transaction. Explain concurrency control techniques in detail. [2+6]

3. Define view. Draw ER-diagram for library management system and convert in relational model. [2+6]

4. Consider the following two tables:

Student

Roll_No	**S_name**	**S_Contact**	**S_address**	**M_Id**
101	Sajan	9846723457	Kathmandu	1
102	Raj	9845678223	Lalitpur	2
103	Rohan	9813556677	Bhaktapur	3

Marks

Marks_Id	**DBMS**	**FOSP**	**Math**
1	89	87	65
2	77	67	80
3	88	65	85

Now answer the following question: 2*4=8

a) Write SQL query to find student name and DBMS marks that scores maximum marks in DBMS.
b) Write SQL query to display all information of students, whose address are arranged in descending order.
c) Write SQL query to increment FOSP marks by 13% who is from Lalitpur.
d) Write SQL to delete details of student whose name starts with ‘S’.

Best of Luck


Faculty of Engineering