

Roll No.

3095

**B. Tech. 4th Semester (EE)
Examination – May, 2025**

DIGITAL ELECTRONICS

Paper : PCC-EE-202-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

1. Compulsory question : $3 \times 5 = 15$

(a) Convert :

(i) Decimal 140.5 into binary.

(ii) Hex 7AC2 into Octal.

(b) Discuss ALU design.

(c) How latch and flip-flop differ in operation ?

3095-1400(P-3)(Q-9)(25)

P. T. O.

- (d) How race around condition is overcome in JK type flip-flop ?
- (e) Discuss Expanding memory size.

UNIT - I

2. (a) Draw and write the Truth table of all universal gates. 7
- (b) Solve the following : $2 \times 4 = 8$
- (i) $A + ABC + CA - AB (A-B-C)$
- (ii) $(A + C + B + 1) + (B + C + 1)$
3. (a) Write short notes on the following : $2 \times 4 = 8$
- (i) TTL
- (ii) Tri State Logic
- (b) At the receiver the Hamming code data received is 1010011. Find out the error and also give the correct code. The Odd parity has been used at transmitter. 7

UNIT - II

4. (a) Simplify the function using Quine Mc-Clusky method : 10
- $X(A, B, C, D) = m\sum(1, 3, 5, 7, 9, 12, 15)$.
- (b) How K Map method helps in solving the algebraic problem ? Also give out sequence of actions. 5

3095- (P-3)(Q-9)(25) (2)

5. (a) Design 16 : 1 multiplexer using 8:1 multiplexer. 8
- (b) Design binary to Gray encoder. Also give out TT. 7

UNIT - III

6. Write short notes on the following : 8,7
- (a) Design of JK flip-flop using SR flip-flop
- (b) Explain working of edge triggered flip-flops.
7. (a) Design modulo 12 ring counter. Also give out its working and TT. 7
- (b) Tabulate comparison of synchronous and ripple counters. 8

UNIT - IV

8. (a) Design PLA with Multiplexer. 7
- (b) Discuss in details R2R Ladder. 8
9. Write briefly about the following : $3 \times 5 = 15$
- (a) ROM
- (b) CCD
- (c) PAL

3095- (P-3)(Q-9)(25) (3)

Roll No.

3096

**B. Tech. 4th Semester (EE)
Examination – May, 2025**

ELECTRICAL MACHINES - II

Paper : PCC-EE-206G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

1. (a) What is the importance of slip in 3-phase induction motor ?
- (b) What is meant by the term turn, coil and winding ?
- (c) What are the conditions for parallel operation of alternator ?
- (d) Derive the e.m.f. equation of an alternator.
- (e) Briefly discuss the principle of shaded pole motor.

3096-3300-(P-3)(Q-9)(25)

P. T. O.

UNIT - I

2. (a) Explain the working principle and construction of 3-phase induction motor.
- (b) Explain the direct online starting method of 3-phase induction motor.
3. (a) Derive the torque equation of 3-phase induction motor.
- (b) Draw and explain the torque-speed characteristic of 3-phase induction motor.

UNIT - II

4. Describe various methods of starting of a 1-phase induction motor.
5. Draw and explain the equivalent circuit of single-phase induction motor using double revolving field theory at standstill and rotor running condition.

UNIT - III

6. (a) Derive an expression for coil span factor and distribution factor.
- (b) Draw and explain phasor diagram for inductive and capacitive load of an alternator.
7. (a) Derive an expression for output power equation of a synchronous machine.
- (b) Explain the two-bright-one-dark-lamp method of synchronising a three phase alternator.

3096- (P-3)(Q-9)(25) (2)

UNIT - IV

8. (a) Describe V-Curve and inverted V-Curve of synchronous motor.
 - (b) Draw and explain the Power-angle curve of synchronous motor.
 9. Write a short note on :
 - (a) Damper winding
 - (b) Synchronous condenser
-

3096- (P-3)(Q-9)(25) (3)

Roll No.

3097

**B. Tech. 4th Semester (EE)
Examination – May, 2025**

TRANSMISSION & DISTRIBUTION

Paper : PCC-EE-210-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Section. Question No. 1 is compulsory. All questions carry equal marks.

1. Compulsory questions :

(i) Write about the evolution of power system.

$3 \times 5 = 15$

(ii) Explain brief about Ferranti effect.

(iii) Explain the concept of GMD.

(iv) Why we use dampers in secondary distribution system.

(v) What is the limitation of HVDC transmission.

3097-1250-(P-3)(Q-9)(25)

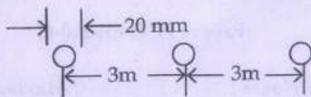
P. T. O.

SECTION - A

2. Explain the various equipment used for substation. 15
3. Write down the comparison of AC and DC system. 15

SECTION - B

4. Determine the capacitance and charging current per unit length of the line when the arrangement of the conductor is shown in figure low the operating voltage is 132 KV. 15



5. Determine the efficiency and regulation of a three phase 100 KM, 50 Hz transmission line delivery 20 MW at a power factor of 0.8 lagging and 66 kV to a balanced load. The conductors are of copper each having resistance 0.1 ohm per Km 1.5 cm outside dia spaced equilateral 2 m between center neglect leakage and use nominal T-method. 15

SECTION - C

6. Drive the expression of sag at unequal support. 15
7. Each conductor of a 33 KV 3 phase system is suspended by a string of three similar insulators the capacitors of each disc is 9 times the capacitance to

3097- (P-3)(Q-9)(25) (2)

ground calculate the voltage across each insulator determine the string efficiency also. 15

SECTION - D

8. Drive the expression of critical disruptive voltage. 15
9. A single core lead covered cable is to be design for 66 kV to earth its conductor radius is 0.5 cm and its three insulating material A B and C have relative permittivities of 4, 2.5 and 4 with maximum permissible stress of 50, 30 and 40 kV/cm respectively. Determine the minimum internal diameters of lead sheet and also discuss the arrangement of the insulating materials. 15

3097- (P-3)(Q-9)(25) (3)

Roll No.

3098

**B. Tech. 4th Semester (EE)
Examination – May, 2025**

SIGNALS & SYSTEMS

Paper : PCC-EE-214-G

Time : Three hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) Explain periodic signals with an example.

1.5 × 10 = 15

- (b) Differentiate between energy and power signals.
- (c) Define deterministic and random signals, giving examples.
- (d) List *two* properties of linear time-invariant (LTI) systems.
- (e) Explain the inter-relationships between unit impulse, unit step, and unit ramp signals.
- (f) Explain one property of Fourier Transform.
- (g) Explain the sampling theorem briefly.

3098-1350-(P-4)(Q-9)(25)

P. T. O.

- (h) Define Laplace Transform (LT) and its application in system analysis.
- (i) Explain the significance of Regions of Convergence (ROC) in Laplace Transform (LT) and Z-transform (ZT).
- (j) Illustrate the concept of rise time through the analysis of a first-order continuous-time low pass filter.

SECTION - A

2. (a) Explain the four operations of continuous-time signal. 8
- (b) Sketch the following signal $x(t) = 4 \sin t$ for $-\infty < t < \infty$. Also check whether the above signal is a power signal or an energy signal or neither. 7
3. What is signal? Explain different types of continuous-time and discrete-time signals with an example. 15

SECTION - B

4. (a) Determine inverse Fourier transform of $X(\omega) = \frac{2j\omega + 1}{(j\omega + 2)^2}$ by partial fraction expansion. 8
- (b) State and prove Parseval's theorem of DTFT. 7

3098- (P-4)(Q-9)(25) (2)

5. State and prove following properties of CTFT 15
- (i) Time shifting
- (ii) Frequency shifting
- (iii) Convolution
- (iv) Differentiation
- (v) Integration

SECTION - C

6. Describe the analysis of second-order continuous-time systems, emphasizing the roles of poles and zeros. Provide a simple illustration. 15
7. Define rise time and its relationship with the time constant of a first-order continuous-time system. Give an example. 15

SECTION - D

8. Define one-sided and bilateral Z-transforms, detailing their properties and the calculation of Z-transform for common signals. Describe how Z-transforms are utilized in solving difference equations and the mapping from the s-plane to the z-plane. 15

3098- (P-4)(Q-9)(25) (3)

P. T. O.

9. The differential equation of a system is given by :

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t)$$

with $y(0^-) = 3$, $\frac{dy(t)}{dt}|_{t=0^-} = -5$. Determine output of the system for $x(t) = 2u(t)$. 15

Roll No.

3099

**B. Tech. 4th Semester (EE)
Examination – May, 2025**

ELECTROMAGNETIC FIELDS

Paper : PCC-EE-216G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Answer the following questions in short : $1.5 \times 10 = 15$
- (a) Define gradient, divergence, and curl in vector calculus.
 - (b) State Coulomb's law and give its mathematical expression.
 - (c) What is Gauss's law, and how is it applied in electrostatics ? p
 - (d) Define electric dipole moment.

3099-1400-(P-4)(Q-9)(25)

P. T. O.

- (e) What is the continuity equation for current.
- (f) What is the difference between scalar and vector potentials in magnetostatics ?
- (g) State Faraday's law of electromagnetic induction.
- (h) Write the wave equation in a conducting medium.
- (i) What do you mean by equipotential surfaces ?
- (j) Give the expression for energy stored in a static electric field.

SECTION - A

- 2. (a) Explain the conversion of a vector from Cartesian to cylindrical and spherical coordinates. 7.5
- (b) Derive the expression for gradient of a scalar field and explain its physical significance. 7.5
- 3. (a) Convert the vector $A = 2\hat{r} + 3\hat{\theta} + 4\hat{z}$ from cylindrical to Cartesian coordinates at $(r = 2, \theta = 30^\circ, z = 4)$. 7.5
- (b) Explain the integral theorems of vectors (Gauss's theorem, Stokes' theorem, Green's theorem). 7.5

3099- (P-4)(Q-9)(25) (2)

SECTION - B

- 4. (a) Derive an expression for electric field intensity due to a point charge using Coulomb's law. 7.5
- (b) Define absolute electric potential and derive its expression for a point charge. 7.5
- 5. (a) Explain electric field in a conductor and derive the boundary conditions for conductors and free space. 7.5
- (b) Discuss applications of Laplace's and Poisson's equations in electromagnetic. 7.5

SECTION - C

- 6. (a) Explain the concept of magnetic flux and magnetic flux density. How are they related ? 7.5
- (b) What is Ampere's Circuital Law ? Derive its integral and differential forms with applications. 7.5
- 7. (a) Define and derive expressions for mutual and self-inductance of a coil. 7.5
- (b) What are magnetic boundary conditions? Explain with mathematical formulations. 7.5

3099- (P-4)(Q-9)(25) (3)

P. T. O.

SECTION – D

8. (a) Discuss the physical meaning and applications of Poynting vector and Poynting theorem. 7.5
- (b) State Maxwell's equations in phasor form and their significance. 7.5
9. (a) Derive the wave equation for a uniform plane wave in free space. 7.5
- (b) What are motional electromotive forces ? Derive an expression for motional EMF. 7.5
-

Roll No.

3100

B. Tech. 4th Semester (EE)

Examination – May, 2025

**MATHEMATICS - III (NUMERICAL METHODS,
PROBABILITY AND STATISTICS)**

Paper : BSC-MATH-204-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

1. (a) Define heat equation and wave equation.
- (b) Explore differences between polynomial and transcendental equations.
- (c) What are differences between Euler and modified Euler Methods.
- (d) If X is a poisson distribution such that $P(x=2) = 9 P(x=4) + 90 P(x=6)$, then find the S. D.

3100-1400 -(P-4)(Q-9)(25)

P. T. O.

- (e) If $P(A)=0.8, P(B)=0.5$ and $P(B/A) = 0.4$, find $P(A \cup B) = ?$
- (f) Find the variance of the number obtained on a throw of an unbiased die.

UNIT - I

2. Find a root of $xe^x = \cos x$, using Regula-Falsi Method correct to four decimal places.
3. (a) Use trapezoidal rule to evaluate $\int_0^1 x^3 dx$, by 5 sub-intervals.
- (b) Use Simpson's $\frac{3}{8}$ rule to evaluate $\int_0^1 \frac{1}{1+x} dx$ taking 8 ordinates and compare the result with its actual value.

UNIT - II

4. Using Bender-Schmidt method, find the value of $u(x,t)$ satisfying the equation $\frac{\partial u}{\partial t} = 4 \frac{\partial^2 u}{\partial x^2}$ and the boundary conditions $u(0,t) = 0 = u(8,t)$ and $u(x,0) = 4x - \frac{1}{2}x^2$ at the point $x=i, i=0, 1, 2, \dots, 7$ & $t = \frac{1}{8}j; j=0, 1, 2, \dots, 5$.

5. (a) Obtain Taylor series for $y(x)$, where $y' + y^2 = x$, $y(0) = 1$.

Use it to compute $y(0.1)$ correct to four decimal places.

- (b) Solve $\frac{dy}{dx} = -xy^2, y=2$ at $x=0$ by modified Euler Method and obtain $y(0.2)$ in two steps of 0.1.

UNIT - III

6. (a) A can hit a target 4 times in 5 shots, B 3 times in 4 shots, C 2 times in 3 shots. They fire a volley. What is the probability that at least two shots hit?
- (b) A bag X contains 2 white and 3 red balls, bag Y contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag Y.

7. (a) Is the function $f(x) = \begin{cases} e^{-x} & \text{for } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$ is a density function?
- (b) Deduce poisson distribution as a limiting case of Binomial distribution.

UNIT - IV

8. (a) For sample A $n_1 = 1000, \Sigma x = 49,000, \Sigma(x - \bar{x})^2 = 7,84,000$ and for sample B $n_2 = 1500, \Sigma x = 70,500, \Sigma(x - \bar{x}) = 24,00,000$. Then discuss the significance of the difference of sample means.

- (b) Random samples drawn from two countries gave the following data relating to the heights of adult males :

Mean height (in inches)	67.42 in country - A	67.25 in country - B
Standard Deviation	2.58 in country - A	2.50 in country - B
Number in samples	1000 in country - A	1200 in country - B

Is the difference between the means significant ?

9. Verify whether poisson distribution can be assumed from the data given below :

No. of defects	0	1	2	3	4	5
Frequency	6	13	13	8	4	3

Roll No.

3018

**B. Tech. 4th Semester (EE)
Examination – May, 2025**

BIOLOGY

Paper : BSC-BIO-201-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

1. Explain in brief :

2.5 × 6 = 15

- (a) Economic importance of microbes
- (b) Central dogma
- (c) Types of RNA
- (d) DNA modifying enzymes
- (e) Explain two applications of enzyme technology
- (f) Genetic engineering

3018-1300 -(P-3)(Q-9)(25)

P. T. O.

UNIT - I

2. Explain in detail :
- (a) Differences between the animal cell and plant cell with diagrams. 7.5
 - (b) Meiosis 7.5
3. What are recessive and dominant alleles ? Explain all the Mendel's law of inheritances. 15

UNIT - II

4. What are proteins ? Explain their structures and important functions in detail. 15
5. Explain in detail :
- (a) Watson and Crick Model of DNA 7.5
 - (b) Structure and Functions of Carbohydrates 7.5

UNIT - III

6. Explain the Recombinant DNA technology in detail with its applications. 15
7. Explain in detail :
- (a) Restriction enzymes with examples 7.5
 - (b) Gene cloning 7.5

UNIT - IV

8. Explain the applications of Biotechnology in agriculture and Medicine. 15
9. Explain the various roles of Biotechnology in betterment of environment in detail. 15
-