

Roll No.

3100

**B. Tech. 4th Semester (EE)
Examination – May, 2023**

**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 test of difference between proportions.
- (b) Explain limitation of Taylor's method.
- (c) Differentiate numerical differentiation and numerical integration.
- (d) Define conditional probability.
- (e) What are Laplace equation and Poisson equation ?
- (f) Suppose that X has a Poisson's distribution, find $P(X = 0)$, if $P(X = 2) = \frac{2}{3} P(X = 1)$.

3100-1302(P-4)(Q-9)(23)

P. T. O.

UNIT - I

2. (a) Using :

x	1	2	3	4
$f(x)$	1	8	27	64

Find $f(3.5)$ by Lagrange interpolation with a quadratic interpolating polynomial.

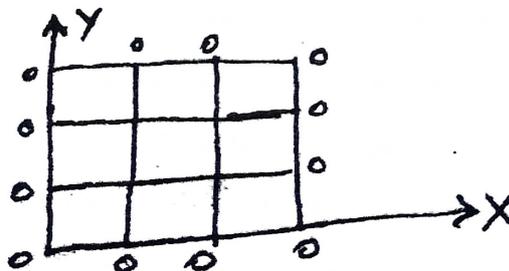
(b) Evaluate $\int_0^3 \frac{1}{1+x^2} dx$, using Simpson's $\frac{1}{3}$ rd rule, take $h = \frac{1}{2}$.

3. Find a root of $x^3 - x - 1 = 0$ using Bisection method correct to three decimal places.

UNIT - II

4. Using Runge-Kutta method of order 4 to compute $y(0.2)$ and $y(0.4)$ if $\frac{dy}{dx} = \frac{x^2 + y^2}{10}$, $h = 0.1$ and $y(0) = 1$.

5. Solve the Poisson's equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square with sides $x = 0 = y$, $x = 3 = y$ with $u = 0$ on the boundary and mesh length = 1.



UNIT – III

6. (a) The odds that a book will be favourably reviewed by three independent critics are 5 to 2, 4 to 3 and 3 to 4 respectively. What is the probability that of three reviews a majority will be favourable ?
- (b) The contents of urns A, B & C are, 1 white, 2 black and 3 red balls, 2 white, 1 black and 1 red balls & 4 white, 5 black and 3 red balls. One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from urns A, B or C ?
7. (a) Six dice are thrown 729 times. How many times do you expect at least three dice to show a five or six ?
- (b) A sample of 100 dry battery cell tested to find the length of life produced the following results : $\bar{x} = 12$ hours, $\sigma = 3$ hours. Assuming the data to be normally distributed, what percentage of battery cell are expected to have life : (i) more than 6 hours, (ii) between 10 and 14 hours ?

UNIT – IV

8. Intelligence test of *two* groups of boys and girls results :

Girls	mean = 84	S. D. = 10	N = 121
Boys	mean = 81	S. D. = 12	N = 81

- (a) Is the difference in mean score significant ?
(b) Is the difference between the S. D. significant ?

9. Record taken of the number of male and female births in 800 families having four children are as follows :

No. of male births :	0	1	2	3	4
No. of female births :	4	3	2	1	0
No. of families :	32	178	290	236	94

Test whether the data are consistent with the hypothesis that the binomial law holds and the chance of male birth is equal to that of female birth, namely

$$p = q = \frac{1}{2}.$$

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3018

**B. Tech. 4th Semester (EE)
Examination – May, 2023**

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. Write the short notes on the following : $2.5 \times 6 = 15$

- (a) Need to study biology
- (b) Allele
- (c) Mitosis
- (d) Amino acids
- (e) RNA
- (f) Ligases

P. T. O.

3018- 125-(P-2)(Q-9)(23)

UNIT – I

2. Explain Procaryotic and Eukaryotic cell in detail with suitable diagrams. 15
3. Write the notes on : $7.5 \times 2 = 15$
- (a) Cell theory
 - (b) Mendel's laws of inheritance

UNIT – II

4. Write the notes on : $7.5 \times 2 = 15$
- (a) Structure and function of glucose
 - (b) Primary structure of proteins
5. Describe the Watson and Crick model of DNA with suitable diagram. 15

UNIT – III

6. What do you mean by Genetic Engineering? Explain in detail. 15
7. Write the notes on:
- (a) Restriction enzymes
 - (b) Transgenic plants.

UNIT – IV

8. Discuss the applications of biotechnology in agriculture, medicine and sewage treatment. 15
9. Explain the enzyme biotechnology in detail. 15

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3095

**B. Tech. 4th Semester (EE)
Examination – May, 2023**

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.

1. (a) Find the decimal equivalent of the following binary numbers assuming sign magnitude representation of binary numbers :

(i) 001000

(ii) 0111

(b) Represent the following numbers in one's complement form :

(i) +7 and -7

(ii) +8 and -8

3095-1300(P-3)(Q-9)(23)

P. T. O.

- (c) Find two's complement of the numbers :
- (i) 01100100
 - (ii) 11011000
- (d) Explain half adder.
- (e) Explain race around condition.
- (f) What do you mean by sequential memory ?

UNIT – I

2. Convert the following :
- (a) Convert $(247)_{10}$ into octal
 - (b) Convert $(0.6875)_{10}$ into octal
 - (c) Convert $(3287.5100098)_{10}$ into octal
3. Explain operation of TTL NAND gate.

UNIT – II

4. Minimise the four variable logic function using k-map :
- $$f(A, B, C, D) = \Sigma m(0, 1, 2, 3, 5, 7, 8, 9, 11, 14)$$
5. Simplify the logic function $Y(A, B, C, D) = \Sigma m(0, 1, 3, 7, 8, 9, 11, 15)$ using the Quine-McClusky minimization technique.

UNIT – III

6. Explain master-slave J-K flip flop.

7. (a) Explain applications of shift register.
(b) Discuss applications of flip flop.

UNIT – IV

8. (a) Explain R-2R ladder D/A converter.
(b) What do you mean by counting A/D converter ?
9. (a) Explain dual slop A/D converter.
(b) What do you mean by CCD ?
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3096

**B. Tech. 4th Semester (EE)
Examination – May, 2023**

ELECTRICAL MACHINES-II

Paper : PCC-EE-206-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 in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) Define crawling.
- (b) Why almost all large size synchronous machines are constructed with rotating field system type ?
- (c) Define coil span, commutator pitch and pole pitch.
- (d) What factors decide the number of poles in synchronous motor ?
- (e) Why 3-phase induction motor draws heavy current during starting ?
- (f) Why short pitch winding is preferred over full pitch winding ?
 $2.5 \times 6 = 15$

3096-1250-(P-3)(Q-9)(23)

P. T. O.

SECTION – A

2. Discuss and explain starting methods of 3-phase induction motor in detail. 15
3. (a) Derive the condition at which the torque becomes Maximum in the induction motor. Also derive an equation for the maximum torque developed. 10
(b) List out the methods used to improve power factor in induction motor. 5

SECTION – B

4. Why single phase induction motor is not self start ? Explain double revolving and cross field theory of single-phase Induction motor. 15
5. Explain rotor resistance control and stator frequency control method of speed control for induction motor. 15

SECTION – C

6. Discuss constructional features and principle of operation of cylindrical rotor alternator. Why does this alternator operate with high speed steam turbines ? 15
7. Define voltage regulation of an alternator. Describe synchronous impedance method of determining regulation of an alternator. 15

3096- (P-3)(Q-9)(23) (2)

SECTION – D

8. What are the methods of starting available for synchronous motor ? Also describe procedure adopted for the same. Mention few applications of synchronous motor. 15
9. Draw and explain equivalent circuit of alternator and draw the phasor diagram of loaded alternator for lagging, leading and unity power factor . 15
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3097

**B. Tech. 4th Semester (EE)
Examination – May, 2023**

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

1. (a) Explain the evolution in power system.
- (b) What do you mean by proximity effect in transmission line ?
- (c) Define sag and elaborate the formula of sag for mechanical design of transmission line.
- (d) What are the advantages of corona ?

SECTION – A

2. Explain the comparison of various types of AC and DC system.

3097-1200-(P-2)(Q-9)(23)

P. T. O.

3. Draw the neat and clean layout of substation and also explain the equipments for substation.

SECTION – B

4. Drive the expression for inductance of single phase composite conductor of line.
5. A single phase 50Hz generator supplies an inductive load of 90Kw at p.f of 0.85 lagging by means of an overhead transmission line 18Km long. The resistance and inductance are 0.0170 ohm and 0.50mH/Km. The voltage at receiving end is required to be kept constant at 11Kv. Find a) sending end voltage and voltage regulation of the line; b) the value of capacitor to be placed in parallel with load such that the regulation is reduced to 60% of that obtained in part (a).

SECTION – C

6. Drive the expression of sag with ice and wind effect ?
7. Drive the expression of string efficiency and method for equal voltage stress over a string.

SECTION – D

8. Explain various methods for grading of cable in line.
 9. Define corona and explain the factors affecting corona loss.
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**B. Tech. 4th Semester (EE)
Examination – May, 2023**

SIGNAL AND 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 in all, selecting one question from each Section. Question No. 1 is compulsory. All questions carry equal marks.

1. (a) Define unit impulse function.
- (b) Explain the relationship between unit step and unit ramp function.
- (c) Explain s to z plane mapping.
- (d) Explain in brief the region of convergence.
- (e) Explain the condition for the existence of fourier transform.

3098-1256-(P-3)(Q-9)(23)

P. T. O.

- (f) Check $x(n) = \cos\left(\frac{n}{6} - \pi\right)$ is periodic or non periodic 2.5 × 6 = 15

SECTION – A

2. (a) Prove that sinewave $x(t) = A \sin \omega_0 t$ is a periodic signal. 8
- (b) Explain the following system : 7
- (i) Linear and non linear system
- (ii) Causal and non causal system
3. (a) Explain the classification of signals. 8
- (b) Compare the energy and power signals. 7

SECTION – B

4. (a) Compare the continuous time FT and DTFT. 7
- (b) Discuss in brief the sampling theorem. 8
5. Explain and prove the properties of fourier transform.

SECTION – C

6. Explain the concept of system bandwidth and rise time through the analysis of a first order CT low pass filter. 15
7. (a) Derive an expression for first order continuous time (CT) system. 7
- (b) Find the pole zero plot for the signal $x(n) = (2)^n u(n)$. 8

SECTION – D

8. Solve the differential equation :

15

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

9. For input $x(t) = e^{-2t} u(t)$. Assume zero initial conditions. Explain and prove the properties of z transform. 15
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**B. Tech. 4th Semester (EE)
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ELECTROMAGNETIC FIELDS

Paper : PCC-EE-216-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. (a) Explain the difference between scalar magnetic potential and vector magnetic potential. 2.5×6
- (b) State point form of Ohm's law and Gauss's law.
- (c) Write the wave equation in a conducting medium.
- (d) Explain the circular cylindrical coordinate system.
- (e) What do you mean by equipotential surfaces ?
- (f) Give the expression for energy stored in a static electric field.

P. T. O.

3099-1300-(P-3)(Q-9)(23)

SECTION – A

2. (a) Express $2x\hat{i} - 3y^2\hat{j} + xz\hat{k}$ in cylindrical coordinate. 7.5
(b) Describe the curl operator. 7.5
3. Given point $P(-2, 6, 3)$ and vector $A = yax + (x + z) ay$. Evaluate A and P in Cartesian, cylindrical and spherical systems. 15

SECTION – B

4. (a) Derive the electric field for each possible case due to a uniformly charged sphere of Radius R and volume charge density ρ . 7.5
(b) Derive the equation of continuity for time varying fields. 7.5
5. (a) Describe the analogies between electric and magnetic fields. 7.5
(b) Differentiate between electrostatic energy and electric density. 7.5

SECTION – C

6. Write notes on : 15
(a) Inductance and mutual inductances
(b) Motional electromotive forces

3099- -(P-3)(Q-9)(23) (2)

7. (a) State and prove Biot-Savart's law. 7.5
(b) Explain the concept of displacement current. How is this different from conduction current? 7.5

SECTION – D

8. (a) State and prove Poynting theorem. 7.5
(b) State Maxwell's equation in phasor form. 7.5
9. Write notes on : 15
(a) Uniform plane waves
(b) Boundary conditions
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