

Roll No. ....

**3001**

**B. Tech. (ECE) 1st Semester  
Examination – December, 2022**

**INTRODUCTION TO ELECTROMAGNETIC THEORY**

**Paper : BSC-PHY-101-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) Show that potential function  $U = x^2 + y^2 - 2z^2$  satisfies Laplace's equation.

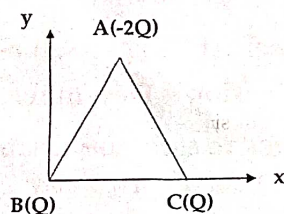
(b) Using Equation  $\vec{\nabla} \cdot \vec{D} = \rho$ , Prove that :

$$\vec{F} = \frac{1}{4\pi\epsilon_0} \frac{Qq}{r^2}$$

(c) Write characteristics of a material to be permanent magnet.



- (d) What are polar and non-polar dielectrics ? Discuss their behavior in an applied electric field.
- (e) Charges  $Q$ ,  $Q$  and  $-2Q$  are placed on the vertices of equilateral  $\Delta ABC$  of sides of length "a" as shown in figure. Find monopole and dipole moment of this system ?



- (f) Define magnetic susceptibility and permeability. Derive the relation between them.  $6 \times 2.5 = 15$

#### UNIT - I

2. (a) Find the potential of a uniformly charged spherical shell of radius  $R$ . 8
- (b) Define Gauss Law. Derive Gauss Law in differential form. 7
3. (a) Discuss Boundary condition on electric field and potential. Show how  $\nabla V$  inherits its discontinuity from  $\vec{E}$ . 10
- (b) Find an expression for the energy of a continuous charge distribution, 5

#### UNIT - II

4. Derive an expression for the torque acting on a current loop when placed in magnetic field. 15

5. (a) Define surface-bound currents and volume-bound currents. Derive an expression for the field of magnetized object. 10
- (b) Explain ferromagnetism on the basis of Domain-Theory. 5

#### UNIT - III

6. Derive Maxwell equations for free space. Explain physical significance of each equation. 15
7. Deduce an expression for emf induced in a rectangular conducting coil. What type of current will be produced if push-pull motion is done rapidly ? Explain. 15

#### UNIT - IV

8. Show that for normal incidence on medium-vacuum interface sum of reflection and transmission coefficient is unity. 15
9. Write characteristics of electromagnetic waves. Derive the expression for wave impedance. Show that field vectors  $E$  and  $H$  are in same phase during propagation. 15

Roll No. ....

**3010**

**B. Tech. 1st Semester (Common for All  
Branches) Examination – December, 2022**

**BASIC ELECTRICAL ENGINEERING**

Paper : ESC-EE-101-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, by selecting **one** question from each Section. Question No. 1 is **compulsory**.*

1. (a) State and explain Faradays law of electro magnetic induction.  $5 \times 3 = 15$

(b) Define Average Value, if the standard value of current is  $i = I_m \sin \omega t$ , what will be the rms value ?

(c) Write down assumptions for an ideal transformer.

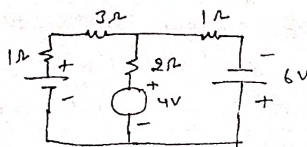
(d) What do you mean by back EMF, give expression ?



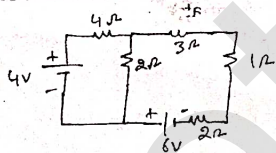
- (e) Briefly write down about attraction type MI instruments.

### SECTION - A

2. (a) State and explain Norton's Theorem. 7  
 (b) In the given circuit, find the current through 2 ohm resistor using Superposition Theorem. 8



3. State Thevenin's Theorem. Determine the value of current flowing through 1 ohm resistance by using Thevenin's theorem. 15



### SECTION - B

4. (a) The maximum value of alternating voltage and current are 420V and 22A respectively in a circuit connected to 50Hz supply and these quantities are sinusoidal. The instantaneous values of the voltage and current are 280V and 10A respectively at  $t = 0$  both increasing positively. 10

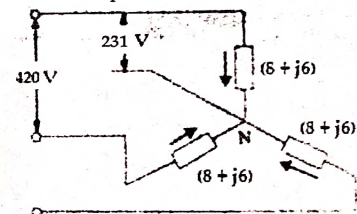
3010-2750-(P-4)(Q-9)(22)

(2)

- (i) Write down the expression for voltage and current at time  $t$ .  
 (ii) Determine the power consumed in the circuit.  
 (b) Define RMS value of a sinusoidal signal and hence deduce Form Factor. 5  
 5. (a) An alternating current of frequency 50Hz has a maximum value of 115A. Write down the equation for its instantaneous value. Reckoning time from the instant the current is zero and becomes positive; find (a) the instantaneous value after  $1/360$  sec and (b) the time taken to reach 96A for the first time. 8  
 (b) Define real power, reactive power and apparent power. Also explain the mathematical equation for all these three terms. 7

### SECTION - C

6. (a) Using appropriate phasor diagram, derive the relationship among voltages and current in star connection in three phase system. 8  
 (b) A balanced star-connected load of  $(8+j6)$  ohms per phase is connected to a balanced 3-phase 420V supply. Find the line current, power factor and total volt-amperes. 7



3010-2750-(P-4)(Q-9)(22)

(3)

P. T. O.

7. (a) Using the appropriate phasor diagram, derive the relationship among voltages and currents in delta connected three phase system. 8
- (b) A delta connected balanced 3 phase load is supplied from a 3 phase, 420V supply. The line current is 22A and the power taken by the load is 10,500W. Find (i) impedance in each branch (ii) the line current, power factor and power consumed if the same load is connected in star. 7

### SECTION – D

8. Briefly explain construction, working and principle of Induction machine with neat labelled diagrams. 15
9. A separately excited DC generator has armature circuit resistance of 0.2 ohm and the total brush drop is 1 V per brush. When running at 960 rpm, it delivers a current of 110A at 260V to a load of constant resistance. If the generator speed drop to 680 r.p.m, with field-current unaltered, find the current delivered to the load. 15



Roll No. ....

**3014**

**B. Tech. 1st Semester (Common for  
All Branches)**

**Examination – December, 2022**

**ENGLISH**

**Paper : HSMC-ENG-101-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. Answer the following questions briefly :  $2.5 \times 6 = 15$

- (a) What is the central theme of 'The Secret of Work' ?
- (b) What is Intellectual Rubbish ?
- (c) Differentiate between 'Course' and 'Coarse' by using in sentence.

- (d) Make words using the prefixes -inter, -extra, -in, -im, ambi
- (e) Describe a Scientific Calculator.
- (f) What are Diphthongs ?

#### UNIT - I

2. (a) Make sentences based on following verb patterns :  $5 \times 3 = 15$

- (i) Sub+Verb+Gerundican Infinitive
- (ii) Sub+Verb+Noun Complement
- (iii) Noun Phrase+Verb+Direct Object
- (iv) Subjet+Verb+Subject Complement
- (v) To Infinitive+Verb+Noun

- (b) Correct the following sentences :

- (i) *I have been living in* I live in Delhi since 2004
- (ii) I have received your letter yesterday
- (iii) The doctor saw my pulse

- (iv) I begged him a favour

- (v) I am looking forward to hear from you

- (c) Do as directed :

- (i) He died ..... cholera. (insert preposition)

- (ii) He is fool, He is knave. (make compound)

- (iii) Honesty is ..... best policy. (insert article)

- (iv) Three and three ..... four. (insert correct verb form)

- (v) I, you and he will go. (re-arrange pronouns)

3. Use the following pairs in your sentences so as to make the meanings of the individual words clear :

$$3 \times 5 = 15$$

- (i) Lately, Late
- (ii) Serial, Cereal
- (iii) Currant, Current
- (iv) Lather, Leather
- (v) Dessert, Desert

UNIT – II

4. (a) Supply One-word Substitutes :  $7.5 \times 2 = 15$

- (i) After death
- (ii) Absence of law and order
- (iii) Fear of books
- (iv) Absence of government
- (v) The study of birds

(b) Supply meanings of the following foreign words and make sentences :

- (i) Ad infinitum
- (ii) Alma-mater
- (iii) Bon Voyage
- (iv) Honorarium
- (v) Ex-gratia

5. (a) Make sentences with the following idioms :

$7.5 \times 2 = 15$

- (i) Dark horse,

3014-3850-(P-7)(Q-9)(22)

( 4 )

(ii) Break the ice,

(iii) Run into

(iv) Turn down

(v) Watch out

(b) Change into passive voice :

(i) He has finished editing his copy.

(ii) Sit down please.

(iii) Who has asked you for chocolate ?

(iv) They have thrown it.

(v) The government has passed a legislation.

*Salim*  
UNIT – III

6. Write short notes on any two :

$7.5 \times 2 = 15$

(a) Respiratory system

(b) Nasal Consonants

(c) Articulatory Organs

3014-3850-(P-7)(Q-9)(22)

( 5 )

P. T. O.



OR

Draw a neat diagram of Speech Mechanism and mark all speech organs.

7. Define Monophthongs. Why are they called pure vowels ? List all Monophthongs ? 15

UNIT – IV

8. Record your impression of Bertrand Russell's essay  
*An Outline of Intellectual Rubbish* 15 × 1 = 15

OR

Describe a typical day of a sister of charity commenting on the four vows taken by the Missionaries.

9. Write an essay on Swami Vivekanand's idea of  
"Working like a master, not like slave". 15 × 1 = 15

OR

Draft an application to the Vice Chancellor of your university and request for review of your curriculum by academic council and upgrade the same in line with industry demands.

---

Roll No. ....

**3008**

**B. Tech. 1st Semester (CSE)  
Examination – December, 2022**

**MATH - I (CALCULUS AND LINEAR ALGEBRA)**

**Paper : BSC-MATH-103-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. Marks are shown against each question.*

1. (a) Evaluate :  $\lim_{n \rightarrow \infty} \frac{e^x - e^{\sin x}}{x - \sin x}$ . 2.5

(b) Using Rolle's theorem for  $f(x) = (x+2)^3(x-3)^4$  find the value of  $x$  in  $(-2, 3)$ . 2.5

(c) Evaluate :  $\int_0^1 \frac{1}{\sqrt{1-x^4}} dx$  in terms of gamma function. 2.5

(d) Find the rank of the matrix :  $\begin{bmatrix} 3 & 4 & 1 & 2 \\ 3 & 2 & 1 & 4 \end{bmatrix}$ . 2.5



(c) Evaluate :  $3A - 4B$ , where  $A = \begin{bmatrix} 3 & -4 & 6 \\ 5 & 1 & 7 \end{bmatrix}$  and

$$B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 0 & 3 \end{bmatrix} \quad 2.5$$

(f) Determine whether the following set of vectors  $(1, 1, 1), (0, 4, 1), (3, 0, 1)$  are linearly independent or linearly dependent. 2.5

(g) Write the zero vector in the vector space  $R^3$  and  $R^4$ . 2.5

(h) Examine whether the following set of vectors forms a basis of  $R^2 : (0, 1), (0, -3)$ . 2.5

(i) Find  $T : R^2 \rightarrow R$  defined by  $T(x, y) = xy$  is a linear transformation. 2.5

(j) Prove that  $A = \frac{1}{3} \begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$  is orthogonal. 2.5

#### UNIT - I

2. (a) Evaluate :  $\lim_{x \rightarrow 1} \left[ \frac{x}{x-1} - \frac{1}{\log x} \right]$  6

(b) Using Taylor's theorem express the polynomial  $2x^3 + 7x^2 + x - 6$  in powers of  $(x - 1)$ . 6.5

3. (a) Find the surface area of the solid formed by revolving the cardioids  $r = a(1 + \cos \theta)$  about the initial line. 6

(b) Show that :  $\int_0^1 y^{q-1} \left( \log \frac{1}{y} \right)^{p-1} dy = \frac{(p-1)!}{q^p}$  where  $p > 0$ ,  $q > 0$ . 6.5

#### UNIT - II

4. (a) Solve the following system of equations :  $2x - y + z = 3; x + 3y - 2z = 1; x + y + z = 6$  by Cramer's rule. 6

(b) If  $A$  and  $B$  are symmetric, prove that  $AB$  is symmetric iff  $AB$  commute. 6.5

5. (a) Find the rank of the matrix :  $\begin{bmatrix} 3 & 4 & 1 & 2 \\ 3 & 2 & 1 & 4 \\ 7 & 6 & 2 & 5 \end{bmatrix}$ . 6

(b) Solve the following equations :  $2x + y + 4z = 12; 8x - 3y + 2z = 20; 4x + 11y - z = 33$  by Gauss Jordan method. 6.5

#### UNIT - III

6. (a) Is the set of all polynomials over  $R$  with constant term zero, form a vector space over reals ? If not why ? 6

(b) Find the basis and dimension of the vectors of  $R^4$  generated by  $(1, -4, -2, 1), (1, -3, -1, 2), (3, -8, -2, 7)$ . 6.5

7. (a) Find a linear transformation  $T : R^4 \rightarrow R^3$  whose image is generated by  $(1, 2, 3)$  and  $(4, 5, 6)$ . 6

(b) Let  $T$  be a linear operator defined by :

$$T(x, y, z) = (2y + z, x - 4y, 3x).$$

Find the matrix of  $T$  w.r.t. the basis  $B = \{(1, 0, 0), (0, 1, 0), (0, 0, 1)\}$ . 6.5

#### UNIT – IV

8. Find the Eigen values and corresponding Eigen vector

of the matrix :  $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ . 12.5

9. (a) Verify that, the matrix :  $\begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{bmatrix}$  is orthogonal. 6

(b) If  $A + B = \begin{bmatrix} 1 & -1 \\ 3 & 0 \end{bmatrix}$  and  $A - B = \begin{bmatrix} 3 & 1 \\ 1 & 4 \end{bmatrix}$  compute the product  $AB$ . 6.5