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 magmatic 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.

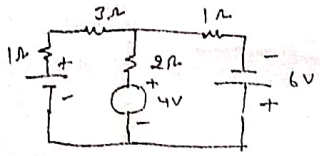
(d) What do you mean by back EMF, give expression ?

(c) Briefly write down about attraction type MI instruments.

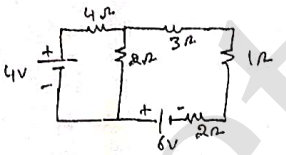
SECTION – A

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

(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

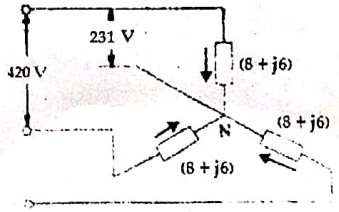
5. (a) An alternating current of frequency 50Hz has a maximum value of 115A. Write down the equation for its instantaneous value. Reckoning time from the instant the current is zero and becomes positive; find (a) the instantaneous value after 1/360 sec and (b) the time taken to reach 96A for the first 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



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. .....

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 : $\lim_{n\to\infty} \frac{e^x - e^{\sin x}}{x - \sin x}$. 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

(e) Evaluate : $3A - 4B$, where $A = \begin{bmatrix} 3 & -4 & 6 \\ 5 & 1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ 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 $T : R^2 \to R$ 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 : $\lim_{x \to 1}\left[\frac{x}{x-1} - \frac{1}{\log x}\right]$ 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 $T : R^4 \to R^3$ 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

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 × 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 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 × 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 × 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 × 2 = 15

(i) Dark horse,

(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.

UNIT – III

6. Write short notes on any *two* : 7.5 × 2 = 15

(a) Respiratory system

(b) Nansal Consonants

(c) Articulatory Organs

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 : $\lim_{n\to\infty} \frac{e^x - e^{\sin x}}{x - \sin x}$. 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

(e) Evaluate : $3A - 4B$, where $A = \begin{bmatrix} 3 & -4 & 6 \\ 5 & 1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ 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 $T : R^2 \to R$ 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 : $\lim_{x \to 1}\left[\frac{x}{x-1} - \frac{1}{\log x}\right]$ 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 $T : R^4 \to R^3$ 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

Roll No. .....

3006

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

CHEMISTRY-I

Paper : BSC-CH-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.

(a) Differentiate between ionic and Vander Waals interaction. $6 \times 2.5 = 15$

(b) Define Hardness. How is it expressed ?

(c) What is an electromagnetic spectrum ?

(d) Write the factors that govern the magnitude of crystal field splitting.

(e) What do you mean by tautomerism ? Give example.

(f) Briefly explain role of doping on band structure.

UNIT – I

2. (a) Explain the various parameters used in Schrodinger wave equation of Hydrogen. What are orthogonal and normalized wave functions ? 8

(b) What are factors on which electron affinity depends ? How does the electron affinity of the elements vary in a group and period ? 7

3. (a) Predict the bond order and magnetic properties of nitrogen molecule by M. O. energy level diagram. 8

(b) Discuss the physical properties of *d* and *f* block elements. 7

UNIT – II

4. (a) Explain addition, oxidation, substitution, reduction and cyclization reactions with suitable examples. 10

(b) Describe R and S configuration. 5

5. (a) Give the synthesis of Asprin drug 7

(b) Draw various conformations of n-butane. Also compare their stability with reason. 8

UNIT – III

6. (a) What are critical constants ? Derive relationship between them. 7

(b) Illustrate the zeolite process used for the softening of water with reaction involved. 8

7. (a) Define corrosion. What are factors affecting corrosion ? How is it prevented ? 7

(b) What do you mean by demineralization and desalination ? Discuss in detail electrodialysis process desalination of sea water. 8

UNIT – IV

8. (a) What is meant by shielding and de-shielding of protons ? Illustrate your answer with suitable example. 8

   (b) Explain the principle of U. V. spectroscopy. 7

9. (a) How will you distinguish ethyl alcohol and acetic acid by I. R. spectra ? 7

   (b) Write brief notes on : $4 \times 2 = 8$

   (i) Flame photometry

   (ii) Magnetic resonance imaging

Roll No. .....

3003

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

SEMICONDUCTOR PHYSICS

Paper : BSC-PHY-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*. All questions carry equal marks.

1. (a) What do you mean by direct and indirect band gap semiconductor materials ?

   (b) Write a short note on the term effective mass.

   (c) What is DLTS ? Discuss.

   (d) What are excitons ? Briefly discuss *two* types of excitions.

(e) How does a semiconductor behave electrically at 0 K temperature ?

(f) Discuss heterojunction devices. $6 \times 2.5 = 15$

UNIT – I

2. Explain the Kroning-Penney model and discuss how it explains formation of energy bands ? 15

3. Discuss quantum free electron theory of electrons. Explain density of states. Fermi energy and probability of occupation. 15

UNIT – II

4. Derive an expression for the carrier concentration in intrinsic semiconductors and discuss the position of Fermi level. 15

5. (a) Draw and discuss the energy band diagram for p-n junction diode. 7

(b) Explain Ohmic and schottky contacts. 8

UNIT – III

6. (a) Discuss the Drude Model to explain electrical conductivity in metals. 10

(b) Explain the Photovoltaic process. 5

7. Derive an expression for joint density of photons in semiconducting materials. 15

UNIT – IV

8. (a) Explain Vander Pauw method and how to determine the resistivity and Hall mobility of a semiconductor material by this method ? 11

(b) What is hot-point probe measurement ? 4

9. (a) What are low dimensional systems ? Explain quantum well, quantum wire and quantum dot with suitable practical examples and applications. 11

(b) Explain VLS growth method to grow nanowires. 4
