

3010

B.Tech. 1st Semester (Common For All Branches)
(G-Scheme) Examination, November-2023
BASIC ELECTRICAL ENGINEERING
Paper - ESC-EE-101-G

Time allowed : 3 hours]

[Maximum marks : 75

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

1. (a) List the essentials of indicating instruments.
- (b) State the difference between mesh and loop.
- (c) Define the following terms w.r.t. AC circuits:
 - (i) Apparent power
 - (ii) Reactive power
- (d) Differentiate between ideal and practical transformer.
- (e) Compare series and parallel resonance.
- (f) Distinguish between linear and non-linear network.

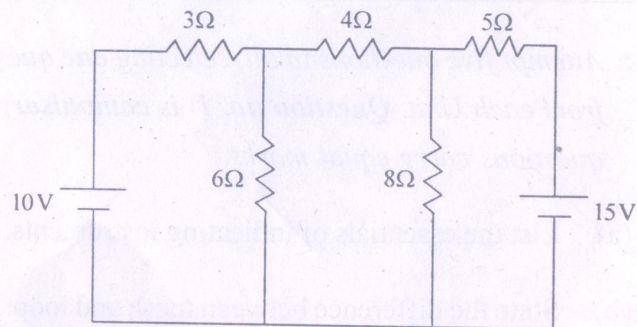
$$6 \times 2\frac{1}{2} = 15$$

3010-P-4-Q-9(23)

[P.T.O.]

Unit-I

2. (a) In the circuit shown below determine the current flowing through different branches by using Nodal Analysis. 7.5



- (b) Illustrate with suitable circuit, phasor diagram and waveforms, that a pure inductor does not consume power. 7.5
3. (a) Justify that the power consumed in an RLC series circuit is $V \cos \Phi$. Draw the waveform of voltage, current and power. 7.5

- (b) The equation of an alternating current is given by $i = 42.42 \sin 628t$, calculate its
- (i) Maximum value (ii) Frequency
- (iii) RMS value (iv) Average value
- (v) Form factor 7.5

Unit-II

4. (a) Discuss open circuit test and short circuit test of single phase transformer. 7.5
- (b) Illustrate the relationship between the line and phase values of voltage and current in a three phase delta connected circuit with relevant phasor diagram and circuit diagram. 7.5
5. (a) List the advantages of 3- ϕ systems over a single phase system. 7.5
- (b) Explain the construction and working of autotransformer. 7.5

Unit-III

6. Explain the working principle of alternator. Elaborate pitch factor and distribution factor. State its expression. 15
7. (a) Explain the working principle of a DC motor with suitable diagram. 7.5
- (b) With the help of a neat circuit diagram, explain a star-delta starter for a three phase induction motor. 7.5

Unit-IV

8. (a) Write a detailed note on Power factor improvement. 7.5
- (b) List out important safety measures against electric shock. 7.5
9. Explain the construction and working principle of single phase induction type energy meter, the construction and working principle of moving coil instruments. 15

B.Tech. (Common for all Branches) 1st Semester (G-Scheme)

Examination, December-2024

BASIC ELECTRICAL ENGINEERING

Paper -ESC-EE-101G

Time allowed : 3 hours]

[Maximum marks : 75

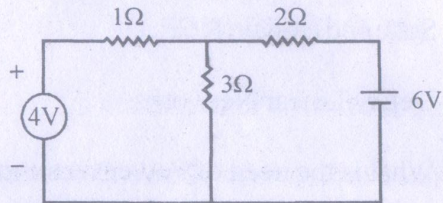
Note : Attempt five questions in all. Question number 1 is compulsory. Attempt four more questions from the Section A, B, C and D by selecting at least one question from each section.

1. (a) State and explain KCL.
- (b) Define Linear Networks.
- (c) What is the need of Power factor improvement?
- (d) Draw the phasor diagram of Ideal Transformer.
- (e) Define Voltage regulation of transformer.
- (f) Define slip in an Induction motor.
- (g) What is the function of armature winding in DC machines?
- (h) What is deflecting torque in measuring instruments?

- (i) State and explain Faradays law of electromagnetic induction.
- (j) Discuss the Eddy current losses in Electrical Machines in brief. $10 \times 2.5 = 25$

Section-A

2. State and Explain Thevenin's theorem. Solve the given circuit to find the value of current flowing through 2 ohm resistor by using Nortons theorem. 12.5



3. Outline the step-by-step procedure for applying the Mesh analysis to find the voltage across a specific resistor in any given Electrical network. 12.5

Section-B

4. Discuss the B.H. Characteristics curve in detail. 12.5
5. Draw and explain the phasor diagram of single phase transformer on capacitive load. 12.5

Section-C

6. Explain how the revolving field is produced in stator of 3 phase induction motor? 12.5
7. Explain the construction and working principle of Synchronous motor. 12.5

Section-D

8. Explain the construction and working principle of watt meter in detail. 12.5
9. What do you mean by earthing? Discuss the working of ELCB in detail. 12.5

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B.Tech. 1st Semester (Common for all Branches)

(G-Scheme) Examination, November-2023

CHEMISTRY-I

Paper-BSC-CH-101-G

Time allowed : 3 hours] [Maximum marks : 75

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

1. (a) Calculate the effective nuclear charge of 3p electrons of Chlorine atom.
- (b) Write electronic configuration of Cr and Cu.
- (c) Define configurations and confirmations.
- (d) Give conditions for corrosion.
- (e) What are van der Waal's interactions ?
- (f) Give principle of NMR spectroscopy. 6×2.5

(2)

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Unit-I

2. Write short note on : 3×5

- (a) Crystal field splitting in octahedral complexes.
 (b) Pi-molecular orbital diagram of benzene.
 (c) Role of doping on band structures.

3. (a) What is ionisation energy ? What are the factors on which it depends ? Give its variation along a period and group. 7.5

(b) What is atomic radii ? Give the factors affecting it ? Why size of a cation is always smaller than parent atom ? 7.5

Unit-II

4. Write short note on the following : 5×3

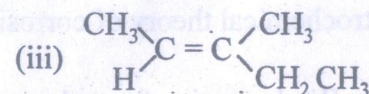
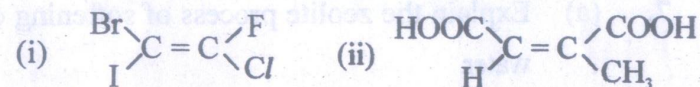
- (a) Stereoisomers
 (b) Optical activity
 (c) Addition reactions
 (d) Oxidation reactions
 (e) Cyclisation

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(3)

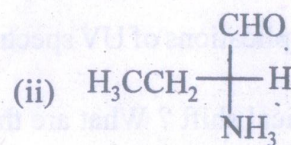
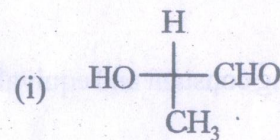
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5. (a) Assign following as E and Z isomer 3×2



(b) Assign R and S configurations to the following :

2×2



(c) Give method of preparation of Paracetamol. 5

Unit-III

6. (a) Explain the various critical constants. 5

(b) How will you measure hardness of water using EDTA method ? 5

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[P.T.O.]

- (c) Give the applications of van der Waals equation for real gases. 5
7. (a) Explain the zeolite process of softening of hard water. 5
- (b) Explain electrochemical theory of corrosion. 5
- (c) Derive van der Waal equation for real gnses. 5

Unit-IV

8. (a) Explain the effect of conjugation in UV spectroscopy. 5
- (b) Explain coupling constant and equivalent protons. 5
- (c) Give major applications of UV spectroscopy. 5
9. (a) What is chemical shift ? What are the scales on which it is measured ? 5
- (b) Explain auxochrome and chromophore with example. 5
- (c) Write short note on Flame Photometry. 5

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B.Tech. (Common for all Branches) 1st Semester

G-Scheme Examination, December-2024

CHEMISTRY-I

Paper-BSC-CH-101-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Question No. 1 is compulsory. Attempt one question from each unit. All questions carry equal marks.

1. (a) Write mathematical representation of Schrodinger Wave Equation and physical significance of Ψ^2 .
- (b) What are various units to measure hardness? Also mention the relationship between them.
- (c) Why IR spectroscopy is called vibrational spectroscopy?
- (d) Define chirality and chiral carbon with the help of a suitable example.
- (e) Define Ligand on the basis of Crystal Field Theory. Give example of two ligands.
- (f) Convert Acetyl chloride and Acetic anhydride into Aspirin.

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[P.T.O.]

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Unit-I

2. (a) Discuss important points of Molecular Orbital Theory. 5
- (b) Explain crystal field splitting in Octahedral complexes. 5
- (c) On the basis of impurities added, explain the types of Intrinsic semiconductors. 5
3. Explain the following terms: 15
- (i) Screening effect
- (ii) Electronegativity
- (iii) Polarising power and polarisability

Unit-II

4. (a) Differentiate the following : 10
- (i) SN1 and SN2 reactions
- (ii) Enantiomers and Diastereomers
- (b) Write the oxidation and reduction reactions of carbonyl compounds. 5
5. Write short note on the following : 15
- (a) Cyclisation reactions

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(3)

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- (b) Structural isomerism in organic compounds
- (c) Conformations of cyclohexane

Unit-III

6. (a) Suggest a suitable way to determine hardness of given water sample. Explain its principle and procedure. 7
- (b) Discuss the terms "Exhaustion & Regeneration" with respect to Zeolite and Demineralisation process. 8
7. (a) Explain various types of Intermolecular forces present in molecules with at least one example of each. 8
- (b) Define Corrosion. Discuss various environmental factors affecting the process of corrosion. 7

Unit-IV

8. Write a short note on the following: 15
- (a) Magnetic Resonance Imaging
- (b) Types of Vibrations in IR spectroscopy
- (c) Upfield and Downfield of NMR signal

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[P.T.O.]

9. (a) Explain the principle and applications of UV spectroscopy. 7
- (b) Give reason for the following: 8
- (i) Splitting of NMR signal
- (ii) TMS taken as standard in NMR spectroscopy

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**B.Tech. 1st Semester (G.Scheme) (Common for all
Branches) Examination, December-2023**

ENGLISH

Paper-HSMC-ENG-101-G

Time allowed : 3 hours]

[Maximum marks : 75

*Note : Please attempt five questions in total. Question
No. 1 is compulsory. Select at least one question
from each unit.*

1. Answer the following questions briefly : $6 \times 2.5 = 15$
- (a) What is true liberation in 'The Secret of Work' ?
 - (b) What is Speech Mechanism ?
 - (c) Differentiate between 'wide' and 'vide'.
 - (d) Make words using the prefixes -in, -ex, -pre, -mal, -uni
 - (e) Describe Vernier Calliper.
 - (f) What is Monophthong ?

Unit-I

2. (a) Make sentences based on following verb patterns : $5 \times 3 = 15$
- (i) Sub + Verb + Direct Object
 - (ii) Sub + Verb + Noun Complement
 - (iii) Noun Phrase + Helping Verb + Adjective + Noun

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[P.T.O.]

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(iv) Subject + Verb + Gerund

(v) Sub + Verb + Infinitive

(b) Correct the following sentences :

(i) Each of the boys have done homework.

(ii) Sandals and towels are essential gear for beach.

(iii) Either Ram or Shyam pay the employees.

(iv) He returned back yesterday.

(v) I am couldn't but laughing.

(c) Do as directed :

(i) He prefers cigar _____ cigarette (insert preposition).

(ii) He is poor. He is honest. (make compound)

(iii) Kejriwal is _____ MLA. (insert article)

(iv) There's _____ who likes to be poor. (neither/ none)

(v) With who do you live ? (correct pronoun)

3. Use the following pairs in your sentences so as to make the meanings of the individual words clear : $5 \times 3 = 15$

(i) Momentary, Momentous

(ii) Elder, Older

(iii) Noted, Noticed

(iv) Literary, Literal

(v) Loose, Lose

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(3)

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Unit-II

4. (a) Supply one word substitutes : $2 \times 7.5 = 15$

(i) A place for keeping birds

(ii) Fear of books

(iii) Government by officials

(iv) Study of human being

(v) Soldiers on foot

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

(i) Alumni

(ii) Ad infinitum

(iii) En route

(iv) De jure

(v) Ex-officio

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

$2 \times 7.5 = 15$

(i) Dark horse

(ii) Break the ice

(iii) Run into

(iv) Turn down

(v) Watch out

(b) Change into passive voice :

(i) I am hitting this rod

(ii) Thank me

(iii) Who has removed my chair ?

(iv) She has asked for apples

(v) The caravan shall destroy our crops

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[P.T.O.]

Unit-III

6. Write short notes on any *two* : 1×15=15

- (a) Phonemes (b) Friction Consonants
(c) Semi Vowels

or

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

7. Define Affricates, Bilabials and Labio dentals. List all of them. 1×15=15

Unit-IV

8. Discuss the main idea of Khushwant Singh's essay '*Mother Teresa*'. 1×15=15

or

Develop a paragraph on 'Digital Economy'.

9. Write an essay on Swami Vivekananda's idea of work and its nature. 1×15=15

or

Write an application to the Director of your institute / college seeking permission for organizing a Tech Fest.

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B.Tech. (Common for all Branches) 1st Semester

(G-Scheme) Examination, December-2024

ENGLISH

Paper-HSMC-ENG-101-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Please attempt five questions in total. Question No. 1 is compulsory. Select at least one question from each unit.

1. Answer the following questions briefly : $6 \times 2.5 = 15$
 - (a) What is "Working like a master, not like a slave" according to Swami Vivekananda ?
 - (b) Outline the central theme contained in Bertrand Russell's essay Intellectual Rubbish.
 - (c) Differentiate between 'loose' and 'lose' by using in sentence.
 - (d) Make words using the prefixes -inter, -en, -un, -im, anti

3014-P-7-Q-9 (24)

[P.T.O.]

- (e) Describe a Scientific Calculator.
- (f) What are Friction Consonants ?

Unit-I

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

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

- (b) Correct the following sentences :

- (i) I have seen him yesterday.
- (ii) You must attend your teacher's instructions
- (iii) The doctor is sleeping for two hours

- (iv) Neither of the boys have come back
- (v) I am looking forward to hear from you
- (c) Do as directed :
- (i) He arrived the airport.
(insert preposition)
- (ii) He is a fool. He is knave. (make compound)
- (iii) Honesty is _____ best policy.
(insert article)
- (iv) Three and three _____ four.
(insert correct verb form)
- (v) I, she and you 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-II4. (a) Supply One-word Substitutes : $7.5 \times 2 = 15$

(i) A place where repair and maintenance is done

(ii) Lack of water in body

(iii) Fear of water

(iv) One who eats human flesh

(v) Soldiers under training

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

(i) Ad infinitum

(ii) alma-mater

(iii) Ex-gratia

(iv) De facto

(v) Ex-parte

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

 $2 \times 7.5 = 15$

(i) get out of hand

(ii) In cats and dogs

(iii) Cost an arm and a leg

(iv) Gut Feeling

(v) Fool's Gold

(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.

(6)

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Unit-III

15×1=15

6. Write short notes on any *two* :

(a) Friction Consonants

(b) Nansal Consonants

(c) Articulatory Organs

or

Explain the working of the Speech' Mechanism with a neat diagram marking all speech organs.

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

Unit-IV

8. Discuss the Central Theme of Bertrand Russell's essay '*An Outline of Intellectual Rubbish*'. 1×15=15

or

Highlight the daily routine of *The Sisters of Charity*.

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Write an essay on Swami Vivekananda's ideas contained in his essay *The Secret of Work*. 1×15=15

or

Imagine your result has been withheld due to some reason and you are not receiving any appropriate response despite repeated applications. Draft an applications to the Registrar of your university to instruct the concerned officer to expedite the process.

3014

B.Tech. (CSE) , 1st Semester (G-Scheme)

Examination, November-2023

MATH-I

Paper - BSC-MATH-103-G

(Calculus and Linear Algebra)

Time allowed : 3 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) Evaluate $\lim_{x \rightarrow 0} \frac{x - \sin x}{\tan^3 x}$.

(b) Show that $\int_0^1 \left(\log \frac{1}{y} \right)^{n-1} dy$, ($n > 0$).

(c) Using Maclaurin's theorem, expand $\sin x$ in power of x .

(d) Find the rank of the matrix $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 1 \end{bmatrix}$.

(e) Are the following vectors $(1, -2, 1)$, $(2, 1, -1)$, $(7, -4, 1)$ linearly independent?

(f) What is the difference between matrix and determinant?

(2)

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- (g) Examine whether the following set of vectors forms a basis of R^2 : $(1, 1), (3, 1)$.
- (h) Find $T : R^2 \rightarrow R$ defined by $T(x, y) = x - y$ is a linear transformation.
- (i) Find the sum and product of Eigen values of

$$\begin{bmatrix} 2 & 3 & -2 \\ -2 & 1 & 1 \\ 1 & 0 & 2 \end{bmatrix}$$

- (j) Express $A = \begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$, as the sum of a symmetric and skew-symmetric matrix.

$$10 \times 2\frac{1}{2} = 25$$

Unit-I

2. (a) Evaluate $\lim_{x \rightarrow 0} \left(\frac{1}{x^2} - \frac{1}{\sin^2 x} \right)$. 6
- (b) Expand $\sin x$ in powers of $\left(x - \frac{\pi}{2}\right)$. Hence find the value of $\sin 91^\circ$ correct to 4 decimal places. 6.5
3. (a) Calculate by double integration, the volume generated by the revolution of the cardioids $r = a(1 - \cos \theta)$ about its axis. 6

3008

(3)

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- (b) Express $\int_0^1 x^5(1-x^3)^{10} dx$ in terms of gamma function. 6.5

Unit-II

4. (a) Solve the following system of equations
 $2x - 3y + z = 9; x + y + z = 6; x - y + z = 2$ by Cramer's rule. 6
- (b) Solve the following equations
 $x + 2y + z = 3; 2x + 3y + 3z = 10; 3x - y + 2z = 13$ by Gauss elimination method. 6.5
5. (a) Show that the matrix $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ is a solution of the equation $A^2 - 5A + 7I_2 = 0$. 6

- (b) Find the rank of the matrix $\begin{bmatrix} 5 & 3 & 14 & 4 \\ 0 & 1 & 2 & 1 \\ 1 & -1 & 2 & 0 \end{bmatrix}$ 6.5

Unit-III

6. (a) Is the set of all rational over R form a vector space over real's? If not why? 6
- (b) Find the basis and dimension of the vectors of R^4 generated by $(1, 4, -1, 3), (2, 1, -3, -1)$ and $(1, 2, 1, -5)$. 6.5

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[P.T.O.]

7. (a) Find a linear transformation $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ whose image is generated by $(1, 2, 3)$ and $(4, 5, 6)$. 6
- (b) If the matrix of the linear transformation T on $\mathbb{R}^2$ relative to usual basis of $\mathbb{R}^2$ is $\begin{bmatrix} 2 & -3 \\ 1 & 1 \end{bmatrix}$. Then find the matrix of T relative to the basis $B_1 = \{(1, 1), (1, -1)\}$. 6.5

Unit-IV

8. Find the Eigen values and corresponding Eigen vector of

the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$. 12.5

9. (a) Express the following matrix as a sum of symmetric and skew-symmetric matrix,

$\begin{bmatrix} 3 & -2 & 6 \\ 2 & 7 & -1 \\ 5 & 4 & 0 \end{bmatrix}$. 6.5

- (b) Diagonalise the matrix $A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$. 6

**B.Tech. (CSE) 1st Semester (G-Scheme) Examination,
December-2024**

MATH-I

Paper-BSC-MATH-103-G

Calculus and Linear Algebra

Time allowed : 3 hours]

[Maximum marks : 75

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

1. (a) Prove that $\beta(m, n) = \beta(n, m)$

(b) Compute that

$$\left(\begin{bmatrix} 1 & -2 & 3 \end{bmatrix} \begin{bmatrix} 7 & -1 & 5 \\ 0 & 2 & 4 \\ -7 & 5 & 0 \end{bmatrix} \right) - \begin{bmatrix} 2 & -5 & 7 \end{bmatrix}$$

(c) If $A = \begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 1 \\ -1 & 1 & 1 \end{bmatrix}$ find $|A|$.

- (d) If $T : U \rightarrow V$ be a linear transformation, then prove
 $T(a_1 u_1 + a_2 u_2 + \dots + a_n u_n) = a_1 T(u_1) + a_2 T(u_2) + \dots + a_n T(u_n)$
- (e) Define Rank and Nullity of a Linear Transformation.
- (f) If x, y are vectors in an inner product space V (F) then prove $x = y$ if $\langle x, z \rangle = \langle y, z \rangle$ for all $z \in V$.

Unit-I

2. (a) Examine the function

$$f(x, y) = x^3 + y^3 - 63(x + y) + 12xy$$

for maxima and minima.

- (b) Show that for every value of x

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots + (-1)^{n-1} \frac{x^{2n-1}}{(2n-1)!} +$$

$$(-1)^n \frac{x^{2n}}{(2n)!} \sin \theta x$$

where $0 < \theta < 1$.

3. (a) Find the surface area of the solid generated by the revolution of the asteroid $x^{2/3} + y^{2/3} = a^{2/3}$ or $x = a \cos^3 t, y = a \sin^3 t$.

- (b) Show that $\beta(p, q) = \int_0^\infty \frac{x^{q-1}}{(1+x)^{p+q}} dx$

Unit-II

4. (a) Solve the following equations by matrix method

$$x + 2y + 3z = 1, \quad 2x + 3y + 2z = 2 \quad \text{and} \quad 3x + 3y + 4z = 1.$$

- (b) Are the following vectors linearly dependent?

If so find relation between them

$$x_1 = (2, -1, 3, 2), \quad x_2 = (1, 3, 4, 2) \quad \text{and}$$

$$x_3 = (3, -5, 2, 2).$$

5. (a) Use Gauss-Jordan method to find inverse of

$$\begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix}.$$

- (b) By determinants evaluate x, y, z , from the equations $x + 2z = 7, x + y + z = 6$ and $3x + y + z = 12$.

Unit-III

6. (a) Show that $Q(\sqrt{2}) = \{a + b\sqrt{2} : a, b \in Q\}$ is a vector space over Q , where
- $$(a + b\sqrt{2}) + (c + d\sqrt{2}) = \{(a + c) + (b + d)\sqrt{2}\}$$
- and $m(a + b\sqrt{2}) = ma + mb\sqrt{2}$.
- (b) Determine whether the following set of vectors in R^3 (R) are Linearly dependent or Linearly dependent $\{(2, 3, 1), (-1, 4, 2), (1, 18, -4)\}$.
7. (a) Find the linear transformation $T : R^2 \rightarrow R$, for which $T(1, 1) = 3$ and $T(0, 1) = -2$.
- (b) Show that composition of two invertible Linear transforms say $T_1 : U \rightarrow V$ and $T_2 : V \rightarrow W$ is also invertible, find $(T_2 T_1)^{-1} = ?$.

Unit-IV

8. For the liner operator $T : R^3 \rightarrow R^3$, find the eigenvalues and the basis for eigen space, when
- $$T(x, y, z) = (x + y + z, 2y + z, 2y + 3z).$$
9. Prove that every finite dimensional inner product space has an orthonormal basis.

**B.Tech. (ME) 1st Semester (G-Scheme) Examination,
November-2023**

MATH-I

Paper-BSC-MATH-101-G

Calculus and Matrices

Time allowed : 3 hours] [Maximum marks : 75

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

1. (a) State Taylor's theorem with Lagrange's form of remainder.
- (b) State Rolle's Theorem.
- (c) State Logarithmic Test for convergence of series.
- (d) Define half range cosine and sine series.
- (e) Find $\vec{\nabla} (\vec{\nabla} \cdot \vec{u}) = ?$, where

$$\vec{u} = x^2y \hat{i} + 2y^2z \hat{j} + z^2x \hat{k}$$
- (f) Find sum and product of eigen values of

$$\begin{bmatrix} 1 & 3 & 6 \\ 0 & -1 & 2 \\ 1 & 3 & 5 \end{bmatrix}$$

Unit-I

2. (a) Verify Rolle's Theorem for

$$f(x) = \log(x^2 + 2) - \log 3 \text{ in } [-1, 1].$$

- (b) Show that

$$\log(x+h) = \log x + \frac{h}{x} - \frac{h^2}{2x^2} + \dots + (-1)^{n-1} \frac{h^n}{n(x+\theta h)^n}$$

3. (a) Find the volume solid generated by revolution

$$\text{about x-axis of the loop of curve } y^2 = \frac{x^2(a+x)}{(a-x)}.$$

- (b) Evaluate $\Gamma\left(\frac{1}{2}\right)$.

Unit-II

4. (a) Test the convergence of following series

$$\sum_{n=1}^{\infty} \sqrt[3]{n^3+1} - n$$

- (b) $1 + \frac{x}{1} + \frac{1}{2} \frac{x^3}{3} + \frac{1.3}{2.4} \frac{x^5}{5} + \frac{1.3.5}{2.4.6} \frac{x^7}{7} + \dots \infty$

5. (a) Expand $\log(1+z)$ about $z=0$ by Taylor's series.

- (b) Find Fourier sine series for unity in $0 < x < \pi$ and

$$\text{hence show } \frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \dots$$

Unit-III

6. (a) If $f(x, y) = x + y$, discuss its continuity at $\left(\frac{1}{2}, \frac{1}{3}\right)$.

- (b) If $u = \frac{1}{2} \log(x^2 + y^2 + z^2)$, prove

$$(x^2 + y^2 + z^2) \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} \right) - 1 = 0$$

7. (a) Discuss the maxima and minima of

$$x^3 y^2 (1 - x - y).$$

- (b) Find the directional derivative of $f = 2xy + z^2$ at the point $(1, -1, 3)$ in direction of vector $\hat{i} + 2\hat{j} + 2\hat{k}$.

Unit-IV

8. (a) Determine the rank of matrix

$$\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & 7 \end{bmatrix}.$$

- (b) Find the value of m and p so that the system of equations ; $x + 2y + m = p$, $x + y + z = 6$, $x + 2y + 3z = 10$ have (i) no solution (ii) unique solution (iii) more than one solution ?

9. (a) Find the eigen value and eigen vectors of matrix

$$\begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}.$$

- (b) Using Cayley-Hamilton theorem find inverse of

matrix $\begin{bmatrix} 7 & -1 & 3 \\ 6 & 1 & 4 \\ 2 & 4 & 8 \end{bmatrix}.$

3007

B.Tech. (ME) 1st Semester (G-Scheme) Examination,
December-2024

MATH-I

Paper-BSC-MATH-101-G

Calculus and Matrices

Time allowed : 3 hours] [Maximum marks : 75

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

1. (a) State Lagrange's mean value theorem.
- (b) State Maclaurin's theorem with Lagrange's form of remainder.
- (c) State Gauss test for convergence of series.
- (d) State Parsval's Theorem.
- (e) If $u = x e^y z$, where $y = \sqrt{a^2 - x^2}$, $z = \sin^2 x$,
find $\frac{du}{dx}$.
- (f) Find eigen value of $\begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}$

3007-P-4-Q-9 (24)

[P.T.O.]

Unit-I

2. (a) Use Lagrange's mean value theorem to determine a point of curve $y = \sqrt{x^2 - 4}$ defined in $[2, 4]$, where tangent is parallel to the chord joining the end points of the curve.

(b) By L'Hopital's rule, evaluate

$$\lim_{x \rightarrow 0} x^m (\log x)^n; \quad m, n \in \mathbb{N}.$$

3. (a) Find the surface area of the solid generated by revolution of ellipse $\frac{x^2}{16} + \frac{y^2}{4} = 1$ about its major axis.

(b) State and prove relation between Beta and Gamma functions.

Unit-II

4. (a) Test the convergence of the series

$$\frac{1^2 \cdot 2^2}{1} + \frac{2^2 \cdot 3^2}{2} + \frac{3^2 \cdot 4^2}{3} + \frac{4^2 \cdot 5^2}{4} + \dots$$

- (b) Discuss the convergence of the series

$$1 + \frac{x}{2} + \frac{12}{3^2}x^2 + \frac{13}{4^3}x^3 + \frac{14}{5^4}x^4 + \dots \infty$$

5. (a) Expand $\sin z$ about $z = \frac{\pi}{4}$ as a Taylor's series.

(b) Obtain half range cosine series for

$$f(x) = \begin{cases} kx & ; 0 \leq x \leq \frac{a}{2} \\ k(a-x) & ; \frac{a}{2} \leq x \leq a \end{cases}$$

Unit-III

6. (a) Prove that $\lim_{(x,y) \rightarrow (0,0)} f(x,y)$ does not exist for

$$f(x,y) = \frac{x^2 - y^2}{x^2 + y^2}, \quad (x,y) \neq (0,0)$$

- (b) If $\sqrt{x^2 + y^2 + z^2} = \frac{1}{u}$, prove

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$$

7. (a) Examine for minimum and maximum values of $\sin x + \sin y + \sin(x + y)$.
- (b) Find directional derivative of $\phi = 4xz^3 - 3x^2yz^2$ at $(2, -1, 2)$ along Z-axis.

Unit-IV

8. (a) Find the rank of matrix $\begin{bmatrix} 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 1 & 2 & 3 & 0 \\ 6 & 8 & 7 & 5 \end{bmatrix}$.
- (b) Show that the system of equations : $2x - 2y + z = \lambda x$, $2x - 3y + 2z = \lambda y$, $-x + 2y = \lambda z$, can possess a non-trivial solution only $\lambda = 1$ 'or' -3 . Obtain the general solution for $\lambda = -3$.

9. (a) Verify Cayley-Hamilton theorem for matrix

$$\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix} \text{ and hence compute its inverse.}$$

- (b) Find the eigenvalue and eigenvectors of the

$$\text{matrix, } \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}.$$

3012

**B.Tech. 1st Semester, (Common for All Branches except
CSE, ECE, IT, CS & IT and EEE)**

(G-Scheme) Examination, November-2023

PROGRAMMING FOR PROBLEM SOLVING

Paper - ESC-CSE-102-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt five questions in all. Question no. 1 is compulsory. Attempts four more questions by selecting exactly one question from each Unit. All questions carry equal marks.

1. (a) Explain the arithmetic operations on number system.
- (b) Differentiate between syntax and logical error.
- (c) Explain Algorithm with suitable example.
- (d) Define Pseudo code with example.
- (e) Explain various conditional statements.
- (f) Define functions and why functions are used in the program.

$6 \times 2\frac{1}{2} = 15$

3012-P-3-Q-9(23)

[P.T.O.]

(2)

3012

Unit-I

2. (a) Convert $(765)_{10}$ into (O_2, O_8, O_{16}) 5
 (b) Convert $(1010101)_2$ into (O_8) 5
 (c) Convert $(CA5)_{16}$ into (O_2) 5
3. Define computer and discuss its functional units in detail with neat and clean diagram. 15

Unit-II

4. (a) What is a flowchart? Draw a flowchart to check the number is positive or negative. 8
 (b) Write an algorithm to check the number is even or odd. 7
5. (a) Write short note on: 8
 (i) Header files
 (ii) Keywords and variables
- (b) Explain Arithmetic expression and its precedence in detail. 7

3012

(3)

3012

Unit-III

6. (a) What are conditional statements? Write a program to calculate the roots of a quadratic equation. 8
 (b) Write a program to find the number is prime or not? 7
7. (a) Differentiate between if and if-else using example. 7
 (b) Write a program to check the string is palindrome or not? 8

Unit-IV

8. What is function? Differentiate between call by value and call by reference by using suitable example. 15
9. (a) What is Recursion? Write a program for Fibonacci series using recursion? 7
 (b) Write a program to find the factorial of a number? 8

3012

3012

**B.Tech. (Common for all Branches except CSE, ECE,
IT, CS&IT and EEE) 1st Semester G-Scheme**

Examination, December-2024

PROGRAMMING FOR PROBLEM SOLVING

Paper-ESC-CSE-102-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : *Attempt five questions in all. Question No.1 is compulsory. Attempt four more questions selecting exactly one question from each unit. All questions carry equal marks.*

1. (a) Discuss header files used in C-language.
(b) What do you understand by Pseudocode? Give examples.
(c) Define RAM.
(d) Define flowchart and the symbols used in flowchart.
(e) Find 2's complement of 1010010110100
(f) Define Data Types. 2.5×6=15

Unit-I

2. (a) Convert $(869)_{10}$ into $()_2$, $()_8$, $()_{16}$ 5
(b) Convert $(10101101)_2$ into $()_{16}$ 5
(c) Convert $(BC5)_{16}$ into $()_2$ 5

3012-P-3-Q-9(24)

[P.T.O.]

(2)

3012

3. Explain the components of computer system with its block diagram in detail. 15

Unit-II

4. (a) What is Algorithm? Write an algorithm to check the number is prime or not. 7.5
- (b) Draw a flowchart to find the roots of a quadratic equation. 7.5
5. (a) Write short note on : 8
- (i) Input and output functions
- (ii) Syntax and logical errors
- (b) Write an algorithm to calculate the simple interest. 7

Unit-III

6. What are Loops? Describe the loops available in C Programming language using suitable examples. 15
7. Explain various Conditional and Branching statements used in C programming. 15

3012

(3)

3012

Unit-IV

8. What are Arrays? Explain parameters passing in functions with an example. 15
9. Write short note on : 15
- (a) String Manipulation functions
- (b) Ackerman function

3012

3003

B.Tech. 1st Semester, (CSE) (G-Scheme)

Examination, November-2023

SEMICONDUCTOR PHYSICS

Paper - BSC-PHY-103-G

Time allowed : 3 hours] [Maximum marks : 75

Note : Attempt five questions in all and each question carry equal marks. Select only one question from each Unit. Question no. 1 is compulsory.

1. Attempt any six questions.

(a) What do mean by Fermi energy and Fermi-Dirac distribution function?

(b) Write fundamentals of quantum free electron theory.

(c) Explain acceptor and donor energy levels in extrinsic semiconductors.

(d) What do you mean by population inversion?

(e) Calculate value of occupation probability of an electron in an energy level which has energy more than Fermi energy by value KT .

3003-P-4-Q-9(23)

[P.T.O.]

(2)

3003

- (f) Explain forward and reverse biasing in P-N junction diode.
- (g) Define photons and phonons.
- (h) Why semiconductor behave like insulator at zero Kelvin temperature. $6 \times 2.5 = 15$

Unit-I

- 2. (a) Explain Kronig-Penney Model for the origin of energy bands. 10
- (b) Discuss effective mass of electron in periodic potential and explain its physical significance. 5
- 3. (a) Derive the expression of energy of electron moving freely in one dimensional box. 10
- (b) Distinguish between conductor, semiconductor and insulator on the basis of energy band theory and show that effective number of free electrons in completely filled energy band vanishes. 5

3003

(3)

3003

Unit-II

- 4. (a) Explain how P-N junction diode is designed and discuss the mechanism at junction before and after biasing. Also plot the V-I characteristics with proper scaling in forward and reverse biasing. 10
- (b) Explain phenomenon of carrier generation and recombination. 5
- 5. (a) Derive expression of Fermi energy and concentration of charge carrier in P-type semiconductor. 10
- (b) Discuss drift and diffusion phenomenon in semiconductor. 5

Unit-III

- 6. (a) Derive the expression of joint density of states in semiconductor. 10
- (b) State and explain Fermi golden rule. 5

3003

[P.T.O.]

7. (a) Explain mathematically how population inversion is necessary condition for optical gain. 10
- (b) Define phenomenon of stimulated absorption, spontaneous emission and stimulated emission. 5

Unit-IV

8. (a) Explain construction and working of four probe method and how it help to measure resistivity of material. 10
- (b) Discuss the experimental method of deep level transient spectroscopy (DLTS). 5
9. Write short notes on:
- (a) Density of states of two dimensional body. 5
- (b) Design of quantum well, quantum wire and quantum dot. 5
- (c) Hot Probe Method. 5

3003

B.Tech. (CSE) 1st Semester G-Scheme

Examination, December-2024

SEMICONDUCTOR PHYSICS

Paper-BSC-PHY-103-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt five questions in all, selecting at least one question from each unit. Question No.1 is compulsory.

1. (a) Explain the significance of the negative temperature coefficient of resistance in semiconductors.
- (b) What is an Exciton? How an Exciton is related to the process of luminescence.
- (c) Give the brief explanation of heterojunction devices.
- (d) What are Quantum dots and what are their applications?
- (e) If $F(E)=0.2$ at 300 K and fermi energy of a metal is 3.2 eV, find the energy at 300 K. Given that $K_B T$ at 300 K is 0.025 eV.

5×3=15

3003-P-3-Q-9(24)

[P.T.O.]

(2)

3003

Unit-I

2. Derive the energy levels expression for a one-dimensional free electron gas. Determine the effect on its energy levels when the length of the confinement box is increased from L to $2L$.

or

3. What is the effect of periodic potential on the energy in a metal? Explain it on the basis of Kronig-Penny model. 15

Unit-II

4. What do you mean by Intrinsic and Extrinsic semiconductors? Obtain an expression for the carrier concentration in intrinsic semiconductors. What would be the position of Fermi level? Explain. 15
5. (a) What are the heterojunction devices? Distinguish Ohmic and Schottky Metal semiconductor junction. 10
- (b) Explain the construction and working of Compose a photodiode. 5

Unit-III

6. What do you mean by the optical joint density of state? Obtain an expression for it. 15

3003

(3)

3003

7. (a) Derive an expression for the conductivity of metals based on the Drude-model. 12
- (b) Determine the wavelength of LED fabricated by the GaAsP material with a bandgap of 1.9 eV. 3

Unit-IV

8. What are 2D, 1D and 0D system/structures in solids? Derive an expression for the density of states and give plots between the density of state and energy for each system. 15
9. Explain transition in UV-visible spectroscopy. Discuss the determination of Bandgap (direct and indirect) by UV-visible spectroscopy. 15

3003

3013

B.Tech. (Common for All Branches) (G-Scheme)

1st Semester Examination, November-2023

WORKSHOP TECHNOLOGY

Paper-ESC-ME-102-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt any **five** questions in total at least **one** question from each unit. **Question no. 1** is **compulsory**. Each question carries equal marks.

1. Write about : 6×2.5=15
- (a) Advantages of plant layout
 - (b) What is Extrusion ?
 - (c) Define Forging.
 - (d) Define Pattern.
 - (e) What do you understand by casting ?
 - (f) Define welding.

Unit-I

2. Write about various types of accidents. How can we minimize them, give suitable examples ? 15
3. Discuss in detail about classification of manufacturing process. 15

3013-P-2-Q-9 (23)

[P.T.O.]

(2)

3013

Unit-II

4. Write about :
- (a) Wire drawing and spinning. 8
 - (b) Defects in timber. 7
5. Describe various sheet metal operations with the help of sketches. 1

Unit-III

6. Explain with neat sketches : Various types of pattern allowances. 15
7. Explain the working principle of shaper machine. Also discuss various parts of shaper machine with the help of neat sketch. 15

Unit-IV

8. Describe the Principle of Arc welding. Also explain MIG welding and it's application with the help of neat sketch. 15
9. Write about :
- (a) Seam welding 8
 - (b) Soldering 7

3013

3013

**B.Tech. (Common for all Branches) 1st Semester
G-Scheme Examination, December-2024**

WORKSHOP TECHNOLOGY

Paper-ESC-ME-102-G

Time allowed : 3 hours]

[Maximum marks : 75

*Note : Q. No. 1 is compulsory and of short answer type.
Each question carries equal marks (15 marks).
Students have to attempt **five** questions in total at
least **one** question from each unit.*

1. Answer the following questions briefly. $6 \times 2.5 = 15$
- (a) Explain the objectives of plant layout in manufacturing processes.
 - (b) List and describe the basic hot and cold working processes.
 - (c) What are the advantages of using timber in carpentry and what are its common defects?
 - (d) Explain briefly the types of allowances associated with patterns.
 - (e) Describe the constituents and properties of sand.
 - (f) Differentiate between gas welding and arc welding processes.

3013-P-3-Q-9(24)

[P.T.O.]

(2)

3013

Unit-I

2. Discuss the importance of industrial safety in manufacturing processes, focusing on the types of accidents, causes and methods of safety. 15
3. Explain the various types of plant layout and their respective advantages in manufacturing setting. 15

Unit-II

4. Describe the sheet metal operations, including measuring, layout marking, shearing, punching, blanking, piercing, forming, bending and joining. 15
5. Discuss the advantages of timber and the classification of metals. Explain the fitting tools and operations in detail. 15

Unit-III

6. Explain the basic steps involved in casting processes, including pattern types, sand, properties and gating system. Discuss common casting defects and their remedies. 15
7. Describe the lathe machine, its operations and CNC machining. Explain the functions of shaper and planner machines in manufacturing. 15

(3)

3013

Unit-IV

8. Provide an introduction to welding and classify welding processes. Explain oxy-acetylene welding and resistance welding, including spot and seam welding. 15
9. Discuss arc welding techniques, including metal arc, TIG, and MIG welding. Explain common welding defects and their remedies, along with the principles of soldering and brazing. 15