Roll No. .....

# 3013

## B. Tech. 2nd Semester
## (Common for all Branches)
## Examination – May, 2025

### WORKSHOP TECHNOLOGY

**Paper : ESC-ME-102-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 in short : $2.5 \times 6 = 15$

(a) How will you classify manufacturing processes ?

(b) Explain duties of first aider.

(c) Define Heat treatment. Explain the need of heat treatment.

(d) What are the various types of furnaces used for melting the metal in a foundry ?

(e) Explain the various properties of moulding sand.

(f) Explain various welding defects.

## UNIT – I

**2.** What is plant layout ? Discuss Objective, advantage and various factors involved in plant layout. 15

**3.** What is an accident ? Explain the cause and effect of accident. 15

## UNIT – II

**4.** Explain the working and parts of Vernier caliper with neat sketches. How its least count can be determined ? 15

**5.** Explain the comparison between hot working and cold working. 15

## UNIT – III

**6.** What are the different materials used for pattern making ? Discuss their merits and demerits. 15

**7.** Explain the working principle of Shaper and Planner machine. 15

## UNIT – IV

**8.** What is the source of heat in resistance welding ? Why is the control of pressure important in resistance welding ? 15

**9.** Explain operation, equipment, advantage disadvantage and application of TIG welding. 15

---

**B.Tech. 2nd Semester G-Scheme**

**Examination, May–2024**

**WORKSHOP TECHNOLOGY**

**Paper–ESC-ME-102G**

**Common for all branches**

*Time allowed : 3 hours]* *[Maximum marks : 75*

***Note :*** ***Question No. 1 is compulsory*** *and of short answer types. Each question carries equal mark (15 marks). Students have to attempt* ***5*** *questions in total at least* ***one*** *question from each section.*

**1.** Answer the following questions briefly (2.5 marks each) (Compulsory-15 marks)

(a) Define and classify manufacturing processes. (2.5 marks)

(b) Explain the types of accidents that can occur in an industrial setting. (2.5 marks)

(c) Discuss the methods of ensuring safety in an industrial environment. (2.5 marks)

(d) What are different casting process? (2.5 marks)

(e) Explain the advantages of sheet metal operations. (2.5 marks)

(f) Describe the basic principle of hot working. (2.5 marks)

**Unit–I**

**(15 marks)**

2. Explain the types of plant layout and discuss their advantages.

3. Discuss the causes and common sources of accidents in an industrial environment. Explain the methods of safety and first aid measures.

**Unit–II**

**(15 marks)**

4. Explain the various carpentry tools and their uses. Discuss the classification of metals and fitting tools.

5. Describe the hot and cold working processes in detail. Compare and contrast hot and cold working.

**Unit–III**

**(15 marks)**

6. Explain the basic steps in casting processes and the types of patterns. Describe sand casting, including its properties and preparation.

7. Discuss the different types of machine tools used in manufacturing processes, including lathe machines, CNC machining, shaper, and planner machines.





**Unit–IV**

**(15 marks)**

8. Explain the classification of welding processes and focus on GAS welding. Describe the common welding defects and their remedies.

9. Discuss arc welding techniques, including metal arc, TIG and MIG welding. Explain the principles behind each welding process.

Roll No. .....

# 3011

## B. Tech. 2nd Semester (CSE) Examination – May, 2025

### PROGRAMMING FOR PROBLEM SOLVING

**Paper : ESC-CSE-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 in short :

(a) What is the purpose of an algorithm, and how is it different from a program ?

(b) Define keywords and variables in C with examples.

(c) Define a while loop and give an example of its use.

(d) What is a break statement, and how is it used in loops and switch cases ?

(e) Define a recursive function and provide an example.

(f) What is the Fibonacci series, and how can it be generated using recursion in C ?

(g) What is a pointer and how does it differ from a regular variable ?

(h) Define a structure in C and give an example.

## UNIT – I

**2.** Describe the differences between a flowchart and pseudocode and illustrate their usage with an example.



**3.** Discuss the different data types in C, including basic, derived, and user-defined types, with examples.

## UNIT – II

**4.** Describe the various types of loops in C and explain their syntax, use cases and differences.

**5.** Discuss the concept of nested loops and conditional branching in C. Provide an example where nested loops and conditionals are used together.

## UNIT – III

**6.** Discuss the concept of recursion in C, explaining how it differs from iteration. Provide an example of a recursive program.

**7.** How are arrays passed to functions in C ? Compare call by value and call by reference and explain how they impact array manipulation.

## UNIT – IV

8. What are structures in C ? Explain how arrays of structures are defined and used, providing an example ?

9. Explain file handling in C. Discuss how files are opened, read, written and closed using standard I/O functions like *fopen*, *fread*, *fwrite*, and *fclose*.

---

# 3011

**B.Tech. (CSE) 2nd Semester G-Scheme**

**Examination, May–2024**

**PROGRAMMING FOR PROBLEM SOLVING**

**Paper-ESC-CSE-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. Write short notes on : 6×2.5
   (a) Keywords
   (b) Conditional operators
   (c) Pointers
   (d) Header files
   (e) Strings
   (f) Functions

**Unit–I**

2. Explain the data types of 'C' language. WAP that prints size of all data types. 15

3. (a) Define header files. 8
   (b) What are storage classes that are used in 'C' language. 7

**Unit–II**

4. Explain conditional branching. WAP that finds greatest of four numbers using if else. 15

5. What is Iteration? WAP that calculates the factorial of a number using while loop. 15

**Unit–III**

6. What are Arrays? WAP in C for matrix multiplication. 15

7. (a) Call by value vs Call by reference 5

(b) WAP for printing fibonacci series up to 10 numbers using recursion. 10

## Unit–IV

8. Describe Array of structures work with a suitable example. 15

9. What are pointers? How are they useful in Dynamic Memory Allocation. 15

*Roll No.* .....

# 3001

## B. Tech. 2nd Semester (ECE) Examination – May, 2025

### 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 Section. Question No. **1** is ***compulsory***. All questions carry equal marks.

**1.** (a) Define steady current. Write down conditions for a current to be steady. 2.5

(b) Write the characteristics of electromagnetic waves. 2.5

(c) Differentiate between diamagnetism, paramagnetism and ferromagnetism. 2.5

(d) Define electric susceptibility and find its relation with dielectric constant. 2.5

(e) Check whether the given field is electrostatic or magnetostatic field. 2.5

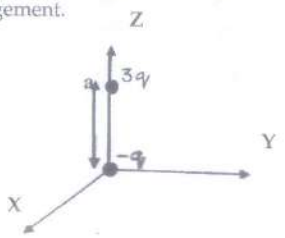
$$\vec{P} = 3x^2z^2\hat{i} - 2xz^3\hat{z}$$

(f) What are polar and non-polar dielectrics ? Discuss their behavior in applied electric field. 2.5

## SECTION – I

**2.** (a) Derive an expression for electric potential and electric field of dipole and discuss their variation with distance. 12

(b) Two point charges 3q and -q are separated by a distance a (as shown in Figure). Calculate monopole and dipole moment for the given arrangement. 3




**3.** (a) Derive boundary conditions for electric field E and electric potential V. 10



(b) Derive differential form of Gauss Law. 5

## SECTION – II

**4.** (a) State Biot-Savart's Law. Discuss its importance and limitations Using Biot-Savart's law, calculate magnetic field near a long straight conductor carrying current (finite). 12

(b) Define magnetic permeability and susceptibility and derive relation between them. 3

**5.** (a) Define surface and volume bound currents. Derive an expression for the field of magnetized object. 10

(b) Prove that the divergence of magnetostatic field is zero ($\nabla.B = 0$). 5

## SECTION – III

**6.** State and prove poynting's theorem and define pointing vector S. Discuss its significance. 15

**7.** Derive *four* Maxwell's equations in vacuum. Discuss characteristics of each Maxwell's Equation. 15

## SECTION – IV

**8.** Obtain wave equations for electromagnetic waves in vacuum. Using these wave equations find the velocity of propagation of electromagnetic waves. 15

9. Derive an expression for reflection and transmission coefficients when electromagnetic wave is incident normally at the interface. Also, show that sum of reflection and transmission coefficients is unity i.e. T+R=1. 15

---

**3001**

**B.Tech. 2nd Semester (ECE)(G-Scheme)**

**Examination, May-2024**

**Introduction to Electro Magnetic Theory**

**Paper : BSC-PHY-101G**

*Time allowed : 3hours]* *[Maximum marks : 75*

---

***Note:*** *Attempt **five** questions in all and each question carries equal marks. Select only **one** question from each unit but the **1st question is compulsory**.*

**1.** (a) Define the electric dipole moment and draw its electric lines of force.

(b) State the Gauss divergence theorem and discuss its physical significance.

(c) What do you mean by electromagnetic breaking ?

(d) Define magnetic Faraday's law of EMI and derive its differential form.

(e) What do you mean by motional electro motive force (e.m.f) ? Explain its anyone example.

(f) Find out the value of divergence of a position vector $(\vec{r}) = x\hat{\imath} + y\hat{\imath} + z\hat{k}$ i.e. $\vec{\nabla}.\vec{r} = ?$

2.5×6=15

**Unit–I**

2. (a) What do you mean by polar and nonpolar dielectrics ? Define electric field intensity $(\vec{E})$, electric polarization vector $(\vec{P})$ and electric displacement vector $(\vec{D})$ and show that $\vec{D} = \varepsilon_0 \vec{E} + \vec{P}$. 7

   (b) Show that the electric field intensity at the axial line due to the short dipole is twice that of the equatorial line. 8

3. (a) Find boundary conditions of electric field intensity and potential. 7

   (b) State Gauss law in electrostatics. Find out electric field intensity due to infinite straight line charge wire (uniform) by using the Gauss law. 8

**Unit–II**

4. (a) Write the integral and differential form of Biot-Savart law and find out the magnetic field intensity at the center of the current-carrying circular wire. 7

   (b) Write important properties of diamagnetic, paramagnetic, and ferromagnetic materials. 8





5. (a) Write the statement of Ampere's law and find out the magnetic field intensity inside the solenoid. 7

   (b) What do you mean by Magnetic vector potential $(\vec{A})$. Show that $\nabla^2 \vec{A} = -\mu_0 \vec{J}$, where $\vec{J}$ is electric current density. 8

**Unit–III**

6. (a) State the equation of continuity and derive its differential form. Also, write the differential form of Maxwell's equations. 7

   (b) Discuss the incompleteness of Ampere's law and explain its modification made by Maxwell. 8

7. (a) What do you mean by self-induction ? If a solenoid has self-induction 'L' and carries current 'I' then show that magnetic energy stored in the solenoid is $\frac{LI^2}{2}$. 7

   (b) What do you mean by Poynting vector $(\vec{S})$ and show that $\vec{S} = \frac{1}{\mu_0}(\vec{E} \times \vec{B})$. 8

## Unit–IV

8. (a) Derive the equation of electromagnetic wave in a vacuum. 7

   (b) Show that the speed of an electromagnetic wave in vacuum $(C) = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$. 8

9. (a) Write about important properties of electromagnetic waves. 7

   (b) If monochromatic electromagnetic wave is incident normally on the surface of dielectric medium of refractive index $(\mu_2)$ from a dielectric medium of refractive index $(\mu_1)$ then show that reflection coefficient $(R) = \left(\frac{\mu_1 - \mu_2}{\mu_1 + \mu_2}\right)^2$ and transmission coefficient $(T) = \frac{4\mu_1\mu_2}{(\mu_1+\mu_2)^2}$. 8

*Roll No. .....*

# 3002

## B. Tech. 2nd Semester (EE) Examination – May, 2025

### WAVES AND OPTICS & QUANTUM MECHANICS

**Paper : BSC-PHY-102-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) Differentiate between transverse and longitudinal waves. Give ***two*** examples for each.

(b) A wave is represented by $y(x,t) = [6\,cm]\sin[(10\,rad/s)t - (10\,rad/cm)x]$

Determine the amplitude, angular frequency, wave number, wavelength and velocity of the wave.

(c) Why are interference fringes in Newton's ring experiment circular in shape ?

(d) Explain the conditions required for the production of laser light.

(e) An electron is confined to a box of length $10^{-8}$ m. Calculate the minimum uncertainty in its velocity. Given $m = 9 \times 10^{-31}$ kg and $\hbar = 1.05 \times 10^{-34}$ J-s.

(f) Distinguish between metals, insulators and semiconductors with the help of energy band diagrams. $2.5 \times 6 = 15$

## SECTION – I

**2.** (a) Define damped harmonic oscillations. Derive its differential equation and show that the amplitude of weakly damped oscillation decays exponentially with time. 12

(b) Derive differential equation for simple harmonic motion. 3



**3.** (a) What are electromagnetic waves ? Derive Fresnel's equations in transverse electric (TE) mode. 12

(b) Discuss the standing patterns in an open and closed-end pipe. 3

## SECTION – II

**4.** (a) Describe the principle, construction, working and theory of the fringe formation of Michelson's Interferometer. How it can be used to find the wavelength of light. 12

(b) A plane transmission grating has 40,000 lines per inch. If length of the diffraction grating is 2 inches then determine the resolving power in third order (n = 3) for a wavelength of 5000 A°. 3

**5.** (a) Describe the principle, construction and working of He - Ne laser. 8

(b) Explain the characteristics of the laser beam. 7

## SECTION – III

**6.** (a) Derive time-dependent Schrodinger wae equation in 3-D. 12

(b) Give the physical significance of wave function $\psi$. 3

7. Solve the Schrodinger equation for a particle in a one-dimensional box and show that the energy eigenvalues are discrete. Obtain the expression for normalized wave functions and plot them for the first four energy level. 15

## SECTION – IV

8. What is the effect of periodic potential on the energy of electrons in a metal ? Explain it on the basis of the Kronig-Penney model and explain the formation of energy bands. 15

9. (a) What is pn-junction ? How potential barrier is formed in the pn-junction diode ? Explain what happens when pn-junction is biased in forward and reverse direction. 10

   (b) Explain the flow of drift current in a semiconductor. 5

# 3002

**B.Tech. (BE) 2nd Semester G-Scheme**

**Examination, May–2024**

**WAVE OPTICS & QUANTUM MECHANICS**

**Paper-BSC-PHY-102G**

*Time allowed : 3 hours]* *[Maximum marks : 75*

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

1. (a) What do you mean by mechanical and non-mechanical waves? 2.5

   (b) Define Total Internal Reflection. 2.5

   (c) Write short notes on the de-Broglie hypothesis. 2.5

   (d) What do you mean by forward and reverse biasing for the P-N junction diode? Draw its characteristics curve. 2.5

   (e) Define Fermi energy and write an expression of occupation probability. 2.5

## Unit–I

2. (a) Define simple harmonic waves and their different types with examples. Write the differential equation of a simple harmonic wave and derive its solutions. 10

   (b) Explain the Brewster angle and Brewster law. 5

3. (a) Derive the velocity of a transverse wave on a stretched string. 10

(b) What do you mean by forced oscillation? Write its differential equation. 5

**Unit–II**

4. (a) Explain Young's double experiment and derive an expression of a fringe width. 10

(b) What do you mean by coherent sources. Explain the concept of division of wavefront and divison of amplitude. 5

5. (a) Define spontaneous emission, stimulated absorption and stimulated emission and derive the relation between Einstein's coefficients. 10

(b) Define pumping, population inversion and resonant cavity. 5

**Unit–III**

6. (a) Derive time-independent Schrodinger wave equations for non-relativistic particles. 10

(b) Explain the physical significance of wave function and write its properties. 5

7. (a) Derive an expression of the energy of a particle in a one-dimensional box. 10

(b) Write short notes on uncertianty principles. 5





**Unit–IV**

8. (a) Explain the origin of energy band theory by using the Kronig-Penny model for solid materials. 10

(b) Distinguish a metal, a semiconductor and an insulator based on energy band theory. 5

9. (a) What do you mean N-type and P-type semiconductors? Derive an expression of Fermi energy for P-type semiconductors in terms of concentration of charge carries and temperature. 10

(b) Write short notes on P-N junction diode. 5

*Roll No. .....*

# 3004

## B. Tech. 2nd Semester (Civil Engg.) Examination – May, 2025

### MECHANICS

**Paper : BSC-PHY-104-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 constrained motion and explain it with an appropriate example.

(b) The spherical coordinate of a point P are (5,30°, 60°). Find its cartesion coordinates.

(c) What are the essential condition of equilibrium in 2 & 3 dimensions ?

(d) Give two important difference between rotational and transitional motion.

(e) What do you mean by forced occilation ?

$5 \times 3 = 15$

## UNIT – I

2. Derive the expression for velocity and acceleration for a particle in term of spherical co-ordinate. Also derive expression for equation of motion. 15

3. (a) What are the scaler and vector ? Also discuss the effect of rotation transformation on them. 10

   (b) Show that Newton's second law in invariant in inertial frames. 5

## UNIT – II

4. Explain the concepts of conservative and non-conservative forces with examples ? Demonstrate why a central force is always conservative. 15

5. What are central and non-central forces ? Derive the energy equation and energy diagrams for elliptical, parabolic and hyperbolic orbits. 15

## UNIT – III

6. State and explain Euler's law of motion for rigid body. Give physical interpretation of Euler's law. 15

7. (a) Calculate the moment of inertia of a ring of negligible width about its central axis. 8

   (b) Discuss the relation between angular momentum and angular velocity and define a moment of inertia tensor. 7

## UNIT – IV

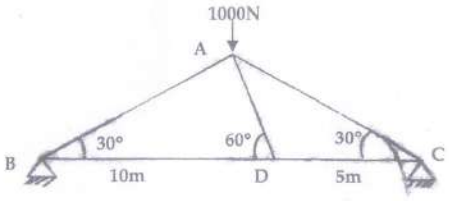
8. (a) What do you mean by free body diagram explain with some suitable example of support and joint.



   (b) Write a short note on Frictional forces ? Discuss its type and the various factors affecting it in detail.

   (c) A mass of 10 kg is at rest on a floor. Value of coefficient of static and dynamic friction are $\mu_s$ = 0.3, $\mu_d$ = 0.2. Find out the acceleration of mass if applied force is 40N ? $5 \times 3 = 15$

9. Define trusses and differentiate between perfect and imperfect trusses. Outline the primary assumptions used in truss analysis. Then analyse the given truss of BC = (BD+DC) = 10m + 5m span, loaded at A as shown in the figure. Find the magnitude and nature of the force in all members. 15



# 3004

**B.Tech. (Civil Engg.) 2nd Semester (G- Scheme)**

**Examination, May-2024**

**MECHANICS**

**Paper : BSC-PHY-104-G**

*Time allowed : 3hours]* *[Maximum marks : 75*

---

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

**1.** (a) The spherical coordinate of a point P are (10°,30°,45°). Find its cartesion coordinates.

(b) What are the limitations of Newton's law ?

(c) Define a rigid body.

(d) What are the essential condition of equilibrium in 2 & 3 dimensions ?

(e) What are conservative and non-conservative forces ? 5×3=15

**Unit–I**

**2.** Derive the expression for Newton's equation of motion in spherical polar co-ordinate. 15

3. (a) Explain the limiting and kinetic friction and give some example. What are the factors on which limiting friction depends ? 8

(b) A mass of 10 kg is at rest on a floor. Value of coefficient of static and dynamic friction are $\mu_s = 0.3$, $\mu_d = 0.2$. Find out the acceleration of mass if applied force is 40N? 7

**Unit–II**

4. What are central and non-central forces ? Derive the energy equation and energy diagrams for elliptical, parabolic and hyperbolic orbits. 15

5. Derive the five-term acceleration formula for the rotating coordinate system and explain the fictitious forces. 15

**Unit–III**

6. What do you understand by a rigid body ? Derive Euler's equation for a rigid body motion. 15





7. (a) State and prove the perpendicular axis theorem for a moment of inertia for a plane lamina. 8

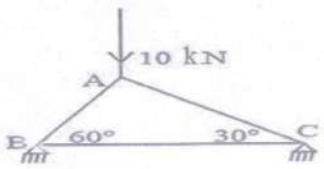
(b) Discuss the relation between angular momentum and angular velocity and define a moment of inertia tensor. 7

**Unit–IV**

8. (a) Define trusses and explain perfect and non perfect trusses. 5

(b) What do you mean by free body diagram, explain with some suitable example of support and joint. 10

9. (a) Analyse the given truss of BC = 5m span, loaded as shown in figure and support at $B$ &$C$. Find the magnitude and nature of the force in all members. 8



*Roll No.* .....

# 3006

## B. Tech. 2nd Semester (Common for all Branches) Examination – May, 2025

### 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.

**1.** Write short answer on the following : $6 \times 2.5 = 15$

(a) What are semiconductors ?

(b) Explain the term chromophore.

(c) Give the unit of Hardness.

(d) Give the advantages of zeolite process for softening of hard water.

(e) Explain Addition reaction with example.

(f) Give the general electronic configuration of p and d-block elements.

## UNIT – I

2. (a) Explain Crystal field splitting in tetrahedral and octahedral complexes. 7.5

(b) Draw MO energy level diagram of NO molecule and discuss its bond order and magnetic properties. 7.5

3. (a) Discuss Electron Affinity. What are the factors affecting electron affinity and how does its vary in a group and period ? 8

(b) Explain the role of doping on band structures. 7



## UNIT – II

4. (a) Discuss the classification of isomerism. Explain structural isomers in detail. 7.5

(b) Differentiate between Enantiomers and Diastereomers. 7.5

5. (a) Give the synthesis of paracetamol. 7.5

(b) Discuss the different types of organic reaction. Explain substitution reactions by giving suitable example. 7.5

## UNIT – III

6. (a) Discuss in detail the EDTA method for hard water determination. 7.5

(b) Discuss the equation of state of real gases. 7.5

7. (a) Explain the Lime-soda process for softening of hard water and discuss the role of lime and soda in the process. 7.5

(b) Discuss Pitting and Galvanic Corrosion. 7.5

## UNIT – IV

8. (a) Discuss the principle of NMR Spectroscopy. 7.5

(b) What is Flame photometry ? Describe its principle and applications. 7.5

9. (a) Discuss the application of Infrared Spectroscopy. 5

(b) Write short note on : 10

(i) Beer's Lamberts law.

(ii) Magnetic Resonance imaging.

# 3006

**B.Tech. 2nd Semester G-Scheme**

**Examination, May–2024**

**CHEMISTRY-1**

**Paper-BSC-CH-101G**

**common for all branches**

*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.** Write short note on: 3×5=15

(a) Specific Rotation

(b) Effective Nuclear Charge

(c) Mechanism of Dry Corrosion

(d) Reduction reaction with example

(e) Hypsochromic Shift

## Section -A

**2.** (a) What are the postulates of Crystal Field Theory and explain crystal field splitting in tetrahedral complexes ? 7

(b) Draw MO energy level diagram of $O_2$ molecule and compare the bond order and magnetic properties of $O_2^+$ and $O_2^-$. 8

3. (a) Explain Ionization Energy. What are the factors affecting Ionization Energy? How does it vary in a group and period? 7

(b) Explain the term Polarizability and Calculate the effective nuclear charge for one of the outer electrons (2p) of oxygen atom. 8

**Section -B**

4. (a) Explain chirality is an essential condition for optical acivity. 7.5

(b) Draw various conformation of n-butane and compare their stability. 7.5

5. (a) Write the synthesis of Paracetamol. 7.5

(b) Discuss the different types of organic reaction. Explain Elimination reactions and Reduction reactions by giving suitable example. 7.5

**Section -C**

6. (a) Explain Hardness of water. How it is measured? Discuss in detail the EDTA method for hardwater determination. 7.5

(b) Discuss the equation of state of real gases. 7.5





7. (a) What do you mean by softening of water. Explain Demineralization process in detail. 7.5

(b) Differentiate between Dry and Wet Corrosion. 7.5

**Section -D**

8. (a) Explain the shielding and deshielding of protons with diagram. 7.5

(b) Discuss the applications of Infra Red Spectroscopy. 7.5

9. (a) Discuss the principle of Ultraviolet Visible Spectroscopy. 7.5

(b) What is Flame photometry? Describe its principle and applications. 7.5

*Roll No.* .....

# 3015

## B. Tech. 2nd Semester (ME) Examination – May, 2025

### MATH-II (Multivariable Calculus, Differential Equations and Complex Analysis)

**Paper : BSC-Math-102-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) Solve :

$$(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$$

(b) Find the integrating factor :

$$(1+x^2)\frac{dy}{dx} + 2xy = \cos x$$

(c) State Green's Theorem.

(d) $\int_0^2 \int_0^2 (x^2+y^2)\,dxdy = ??$

(e) State Residue theorem.

(f) State Cauchy-Goursat theorem. $2.5 \times 6 = 15$

## UNIT – I

**2.** (a) Evaluate $\iint_A xy\,dxdy$, where $A$ is the domain bounded by $x$-axis, $x = 2a$ & $x^2 = 4ay$. 7.5

(b) Change the order of integration & solve $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dydx$. 7.5

**3.** (a) $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz\,dxdydz$. 7.5

(b) Verify Green's theorem for $\int_C [(xy+y^2)dx + x^2dy]$, where $C$ : is bounded by $y = x$ & $y = x^2$. 7.5



## UNIT – II

**4.** (a) Solve : $xy(1+xy^2)\frac{dy}{dx} = 1$ 7.5

(b) Solve : $(xy^2 - e^{1/x^3})dx - x^2ydy = 0$ 7.5

**5.** (a) Solve by variation of parameter : 7.5

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x \log x$$

(b) Solve : $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x$ 7.5

## UNIT – III

**6.** Show that the function $u = e^{-2xy}\sin(x^2 - y^2)$ is harmonic. Find the harmonic conjugate $v$ & express $u + iv$ as an analytic function of $z$. 15

**7.** (a) Show that the function $f(z) = z|z|$ is not analytic anywhere. 10

(b) Under the transformation $w = \frac{1}{z}$, find the image of $|z - z_i| = 2$. 5

## UNIT – IV

**8.** (a) Evaluate $\int_0^{1+i}(x^2 - iy)dz$ along the path : 7.5

(i) $y = x$ (ii) $y = x^2$

(b) Evaluate $\oint_C \frac{e^{-z}}{z+1}dz$, where $C$ is the circle $|z| = ½$. 7.5

**9.** (a) Evaluate $\oint_C \frac{z-3}{z^2+2z+5}dz$, where $C$ is the circle $|z+1-i| = 2$. 7.5

(b) $\int_0^{2\pi} \frac{d\theta}{5-3\cos\theta}$ 7.5

**3015**

**B.Tech. (ME) 2nd Semester (G-Scheme)**

**Examination, May-2024**

**MATH-II**

**Paper : BSC-MATH-102-G**

**Multivariable Calculus, Differential Equations & Complex Analysis**

*Time allowed : 3hours]* *[Maximum marks : 75*

---

***Note:*** *Answer any* ***one*** *from each unit.* ***Question No.-1 is compulsory.***

**1.** Answer all the questions : 6×2.5=15

(a) Solve

$(12x + 5y - 9)dx + (5x + 2y - 4)dy = 0$

(b) Find the Integrating factor

$\cos^2 x \frac{dy}{dx} + y = \tan x$

(c) State Gauss theorem.

(d) Write the Cauchy-Riemann equation.

(e) Define poles and Singularity of an Analytic function.

(f) $\int_0^{2a} \int_0^{x^2/4a} xy \, dy \, dx$

**Unit–I**

2. (a) $\iint (x+y)^2\,dx\,dy$ over the area bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ 7.5

   (b) Evaluate by changing the order of Integration $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2\,dx\,dy.$ 7.5

3. (a) Apply Green's theorem to evaluate $\int_C [(2x^2-y^2)dx+(x^2+y^2)dy]$ where $C$ is the boundary of the area enclosed by $x$-axis and upper half of circle $x^2+y^2=a^2$. 7.5

   (b) $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z}$ 7.5

**Unit–II**

4. (a) Solve the differential equation

$$xy(1+xy^2)\frac{dy}{dx}=1$$ 7.5

   (b) Solve : $y-2px=\tan^{-1}(xp^2)$ 7.5

5. (a) Solve : $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+y=\log x$ 7.5

   (b) Solve by method of variation of Parametre

$$y''-6y'+9y=\frac{e^{3x}}{x^2}$$ 7.5





**Unit–III**

6. Determine the analytic function whose real part is $u=e^{2x}(x\cos 2y-y\sin 2y)$ 15

7. (a) Show that the function $f(z)=\sqrt{|xy|}$ is not regular although the Cauchy-Riemann Equation is satisfied. 10

   (b) Find the image in $w$-plane of the disk $|z-1|\le 1$ under the mapping $w=\frac{1}{z}$. 5

**Unit–IV**

8. (a) Use Cauchy Integral formula to evaluate $\oint_C \frac{e^{2z}}{(z+1)^4}\,dz$ where $C$ is the circle $|z|=2$. 7.5

   (b) Evaluate $\oint_C^{2+i} (\bar{z})^2$ along 7.5

   (i) The line $y=x$

   (ii) The real axis to 2 and then vertically to $2+i$

9. (a) Evaluate $\oint_C \frac{2z-1}{z(z+1)(z-3)}\,dz$ where $C$ is the circle $|z| = 2$. 7.5

(b) $\int_0^{2\pi} \frac{\cos 3\theta\, d\theta}{5-4\cos\theta}$ 7.5

*Roll No.* .....

# 3016

## B. Tech. 2nd Semester (CSE) Examination – May, 2025

### MATHEMATICS - II (Probability and Statistics)

**Paper : BSC-MATH-104-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) Two persons $A$ and $B$ toss an unbiased coin alternatively on the understanding that the first who gets the head wins. If $A$ starts the game, find their respective chances to win.

(b) Two cards are drawn successively with replacement from well shuffled pack of 52 cards. Find mean and variance of the number of kings.

(c) A power supply unit for a computer component is assumed to follow an exponential distribution with a mean life of 1200 hours. What is the probability that the component will

(i) Fail in the first 300 hours ?

(ii) Survive more than 1500 hours ?

(d) Determine moment generating function of binomial distribution and hence obtain mean and variance of binomial distribution.

(e) The first four moments of a distribution about 5 of the variable are 2, 20, 40 and 50. Obtain all moments about mean. Also find skewness using moments.

(f) What do you mean by Testing of Statistical Hypothesis ? How can we set up null and alternative hypothesis ? $2.5 \times 6 = 15$

## UNIT – I

**2.** (a) Probability of a man hitting a target is $\frac{1}{3}$. If he fires 6 times, what is the probability of hitting ?

(i) at the most 5 times.



(ii) at least 5 times.

(iii) exactly once.

(iv) If he fires so that the probability of his hitting target once is greater that $\frac{3}{4}$, find $n$. 8

(b) In sampling a large number of parts manufactured by machine, the mean number of defectives in sample of 20 is 2. Out of 1000 such samples, how many would be expected to contain at least 3 defective parts. 7

**3.** (a) Find the m.g.f. of the random variable $X$ having the probability density function : 8

$$f(x) = \begin{cases} x & 0 \le x < 1 \\ 2-x & 1 \le x < 2 \\ 0 & \text{otherwise} \end{cases}$$

Also, find the mean and variance of X using m.g.f.

(b) State and prove Chebyshev's inequality. 7

## UNIT – II

**4.** (a) If $f(x) = ke^{-|x|}$ is a distribution function where $-\infty < x < \infty$. 7

(i) Find the value of $k$.

(ii) Variance of the random variable.

(iii) Probability $P(0 \le X \le 4)$

(b) The distribution of random variable is given by :

$$f(x) = Ce^{-\frac{1}{50}(9x^2 - 30x)}, \quad -\infty \le x \le \infty$$

Find the C, mean and the variance of the random variable. Also find the upper 5% value of the random variable. 8

**5.** (a) If X and Y are two random variables having joint density function.

$f(x, y) = 2 - x - y; \quad 0 < x < 1; \quad 0 < y < 1$

$= 0$, otherwise

Find :

(i) The marginal and conditional density functions of X and Y.

(ii) Coefficient of correlation

(iii) $E(X \mid y)$ 8

(b) A factory has three machine X, Y and Z producing 1000, 2000 and 3000 bolts per day respectively. The machine X produces 1% defective bolts, Y produces 1.5% and Z produces 2% defective bolts. At the end of the day, a bolt is drawn at random and it is found to be defective. What is the probability that this defective bolt has been produced by the machine X ? 7



## UNIT – III

**6.** (a) Discuss the kurtosis of the following frequency distribution : 7

| Marks | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
|---|---|---|---|---|---|---|---|
| No. of Students | 8 | 12 | 20 | 30 | 15 | 10 | 5 |

(b) Established the formula $r = \dfrac{\sigma_x^2 + \sigma_y^2 - \sigma^2_{x-y}}{2\sigma_x\sigma_y}$,

where $r$ is the coefficient of correlation between x and y and $\sigma_x, \sigma_y$ and $\sigma_{x-y}$ are concerned standard deviations. Hence, evaluate $r$ from the following data : 8

| $x$ | 21 | 23 | 30 | 54 | 57 | 58 | 72 | 78 |
|---|---|---|---|---|---|---|---|---|
| $y$ | 60 | 71 | 72 | 83 | 110 | 84 | 100 | 92 |

**7.** (a) If x and y are two independent Poisson variates where $P(X = 1) = P(X = 2)$ and $P(Y = 2) = P(Y = 3)$, find the mean and variance of $(X - 2Y)$. 7

(b) Fit a parabolic curve of regression of $y$ on $x$ to the data given below : 8

| $x$ | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 |
|---|---|---|---|---|---|---|---|
| $y$ | 1.1 | 1.3 | 1.6 | 2.0 | 2.7 | 3.4 | 4.1 |

## UNIT – IV

**8.** (a) A sample of heights of 6400 soldiers has a mean of 67.85 inches and a S.D. of 2.56 inches. While another sample of heights of 1600 sailors has a mean of 68.55 inches with S.D. of 2.52 inches. Do the data indicate that the sailors are on average taller than soldiers ? 8

$(Z_{0.05} = 1.645)$

(b) A random sample of 27 pairs of observations from a normal population gives a correlation coefficient of 0.42. Is it likely that the variables in population are uncorrelated ? $(t_{0.05}\ at\ d.f.25 = 2.06)$ 7

**9.** (a) The theory predicts the proportion of beans in the four groups, $A_1, A_2, A_3, A_4$ should be in The ratio 9 : 3 : 3 : 1. In the an experiment with 1600 beans the numbers in the four groups were 882, 313,287



and 118. Does the experimental result support the theory ? 7

$(\chi^2 at\ 5\% = 7.815)$

(b) A certain drug is claimed to be effective in curing colds. In an experiment on 164 people with colds, half of them were given the drug and half of them given sugar pills. The patient's reaction to the treatment is recorded in the following table. Test the hypothesis that the drug is no better than sugar pills for curing colds. 8

| | *Helped* | *Harmed* | *No effect* |
|---|---|---|---|
| *Drug* | 104 | 20 | 40 |
| *Sugar pills* | 88 | 24 | 52 |

$(\chi^2_{0.05}\ for\ 2\ d.f. = 5.99)$

# 3016

**B.Tech. (CSE) 2nd Semester (G-Scheme)**

**Examination, May-2024**

**MATH-II**

**Paper : BSC-Math-104G**

**Probability and Statistics**

*Time allowed : 3hours]* *[Maximum marks : 75*

---

***Note:*** *Attempt **five** questions in total by selecting **one** question from each unit. **Question No. 1 is compulsory.***

**1.** (a) If $X$ and $Y$ are Independent random variable then show that $E(XY) = E(X).E(Y)$

(b) Define multinomial distribution.

(c) Discuss Gamma distribution and find its mean.

(d) Fit the curve $y = ae^{bx}$ to the following data :

| $x$ | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| $y$ | 25 | 38 | 56 | 84 |

(e) Write a short note on :

(i) Critical Region

(ii) Errors

(iii) Level of significance

(f) A random sample of 27 pairs of observations from a normal population gives correlation coefficient of 0.42. Is it likely that the variables in the population are un correlated ? 15

**Unit–I**

2. (a) A student takes his examination in four subjects $P, Q, R, S$. He estimates his chances of passing in $P$ as $\frac{4}{5}$, in $Q$ as $\frac{3}{4}$, in $R$ as $\frac{5}{6}$ and in $S$ as $\frac{2}{3}$. To quality, he must pass in $P$ are at least two other subjects, What is the probability that he qualifies ?





(b) A die is tossed thrice. A success is getting '1 or 6' on a toss. Find the mean and variance of the number of successes. 15

3. (a) Show that if $\mu$ and $\sigma$ be the mean and s.d. of a random variable $X$ with p.d.f. $f(x)$ then :

$P[\mu - K_6 < X < \mu + K_6] = P[|X - \mu| < K_6] \geq 1 - \frac{1}{K^2}$ where $K$ is same positive constant.

(b) A manufacturer knows that the condensers he makes contain on an average 2% defective, he packs them in a boxes of 100. What is the probability that a box selected at random will contain 3 or more faulty condensers ? 15

**Unit–II**

4. (a) If $f(x) = 6x(1-x), 0 \leq x \leq 1$. Verify that it is a p.d.f. Also final the mean and variance.

(b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. 15

5. (a) If $X$ and $Y$ are two continuous independent random variable then determine the p.d.f. of quotient $Z = \frac{X}{Y}$.

(b) State and prove Baye's Rule. 15

**Unit–III**

6. (a) Calculate mean and mode of the following data relating to weight of 120 articles :

| Weight (In gm) | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
|---|---|---|---|---|---|---|
| No. of articles | 14 | 17 | 22 | 26 | 23 | 18 |





(b) The first four moments about the working mean 28.5 of distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about mean. Also evaluate $\beta_1$, $\beta_2$ and comments upon skewness and kurtosis of the distribution. 15

7. (a) Three judges $A, B, C$ give the following ranks. Find which pair of judges have common approach ?

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | 1 | 6 | 5 | 10 | 3 | 2 | 4 | 9 | 7 | 8 |
| B | 3 | 5 | 8 | 4 | 7 | 10 | 2 | 1 | 6 | 9 |
| C | 6 | 4 | 9 | 8 | 1 | 2 | 3 | 10 | 5 | 7 |

(b) Find the regression line $y$ on $x$ for the following :

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| $y$ | 10 | 12 | 16 | 28 | 25 | 36 | 41 | 49 | 40 | 50 |

15

## Unit–IV

8. (a) A sample of 900 members is found to have a mean of 3.4cm. Can it be reasonably regarded as a truly random sample from a large population with mean 3.25cm and s.d. 1.61cm.

(b) A group of 10 rats fed on a diet *A* and another group of 8 rats fed on a different diet *B*, recorded the following increase in weights :

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Diet A : | 5 | 6 | 8 | 1 | 12 | 4 | 3 | 9 | 6 | 10 | gm |
| Diet B : | 2 | 3 | 6 | 8 | 10 | 1 | 2 | 8 | gm | | |

Does it show the superiority of diet A over that of B ? 15





9. (a) Two random samples from two normal populations are given below :

Sample I : 16 26 27 23 24 22

Sample II : 33 42 35 32 28 31

Do the estimates of population variances differ significantly ?

(b) In an experiment on immunization of cattle from tuberculosis, following results were obtained :

| | Affected | Unaffected |
|---|---|---|
| Inoculated | 12 | 26 |
| Not Inoculated | 16 | 06 |

Examine the effect of vaccine in controlling susceptibility to tuberculosis. 15

*Roll No.* .....

# 3010

## B. Tech. 2nd Semester (Common for all Branches) Examination – May, 2025

### 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, selecting ***one*** question from each Section. Question No. **1** is ***compulsory***.

**1.** Answer the following questions in short : $2.5 \times 10 = 25$

(a) State and Explain KVL.

(b) Define Bilateral Networks.

(c) What is Power Factor ?

(d) Write down the assumptions of Ideal Transformer.

(e) Define efficiency of transformer.

(f) Define slip in an Induction motor.

(g) What is the function of field winding in DC machines ?

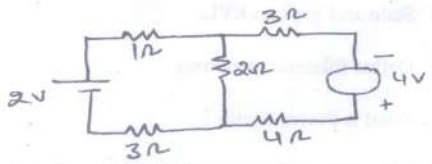
(h) What is damping torque in measuring instruments ?

(i) State and explain faradays law of electromagnetic induction.

(j) Discuss the hysteresis losses in Electrical Machines in brief.

## SECTION – A

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






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

## SECTION – B

4. Discuss the properties of various types of Magnetic materials in detail. 12.5

5. Draw and Explain the phasor diagram of single phase transformer on inductive load. 12.5

## SECTION – C

6. Explain how the revolving field is produced in 3 phase induction motor ? 12.5

7. Explain the construction and working principle of D C Generator. 12.5

## SECTION – D

8. Explain the construction and working principle of Energy meter in detail. 12.5

9. What do you mean by earthing ? Discuss the working of MCB in detail. 12.5

---

**B.Tech. (Common For All Branch G-Scheme)**

**2nd Semester Examination, May-2024**

**BASIC ELECTRICAL ENGG.**

**Paper : ESC-EE-101 G**

*Time allowed : 3hours]* *[Maximum marks : 75*

---

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

1. (i) Distinguish between : 2.5

   (a) Active and Passive elements

   (b) Loop and Mesh

   (ii) Define the following terms : 2.5

   (a) Phase

   (b) Peak factor

   (c) R.M.S. value

   (d) Impedance triangle

   (e) Reactive power

(iii) A moving coil ammeter can read upto 2A has a resistance of 0.2 Ω. How could this instrument be adopted to read :

(a) Voltage upto 300 volts

(b) Current upto 100 Amps. 2.5

(iv) Explain what is meant by regulation of a transformer. 2.5

(v) Write short note on "All-day efficiency of transformer". 2.5

(vi) A coil takes a current of 10 A at a phase angle of 30° when connected to a 250V, 50Hz supply. Calculate the resistance and inductance of the coil. 2.5

(vii) Define the following terms of rotating electrical machines : 2.5

(a) Field coils

(b) Armature winding

(c) Commutator

(d) Back E.M.F.





(viii) Which type of motors are self-starting & why ? 2.5

(ix) What is earthing ? Name the different methods of earthing. 2.5

(x) What is a circuit breaker ? Name atleast four types of circuit breaker. 2.5

**Unit–I**

2. (i) State super position theorem. Determine the potential difference across 120 Ω resistor in the network shown in fig. 1 using superposition theorem. 6.25

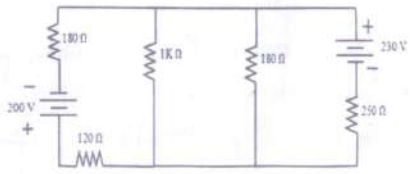



Fig-1

(ii) Show that the power consumption, when three identical impedances are connected in delta across a balanced 3-phase supply is three times that when the same impedances are connected in star across the same 3-phase supply. 6.25

3. (i) Explain with mathematical expression that power consumed in a pure capacitance is zero. What do you understand by active and apparent power ? 6.25

(ii) State an application of Thevenin's and Norton's theorem. Using Thevenin's theorem, find the current in section XY of distribution network shown in fig 2. 6.25

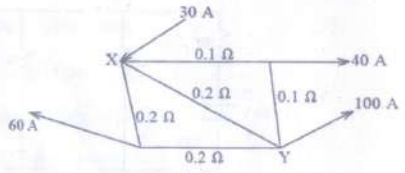



Fig-2





**Unit–II**

4. (i) Explain two-wattmeter method to measure power in a 3-phase unbalanced load. Show the phasor relationship between line voltage and line current with phase voltage and phase current in star-connected circuit. 6.25

(ii) Explain open circuit and short circuit tests of transformer in detail. 6.25

5. (i) Explain series resonance. What is resonance curve ? Explain how it is obtained using suitable equations. Determine Q-factor for a series resonance circuit. 6.25

(ii) Explain the principle of working of an auto–transformer. In what ways does an auto–transformer differ from a conventional two–winding transformer ? 6.25

**Unit–III**

6. (i) Explain the production of revolving field & hence, principle of operation of three-phase induction motor. 6.25

(ii) A D.C. shunt motor runs at 1000 r.p.m. on 200 V supply. Its armature resistance is 0.8 Ω and the current taken is 40 A, in addition to the field current. What resistance do you connect in series with the armature to reduce the speed to 600 r.p.m., the current in the armature winding the same ? Neglect armature reaction. Give applications of D.C. shunt motor. 6.25

7. (i) A D.C. shunt machine connected to 250V mains, has an armature resistance of 0.12 Ω and field resistance of 100 Ω. Calculate the ratio of speed as a generator to motor when the line current in each is 80 A. 6.25





(ii) Derive an expression for the torque developed in an induction motor. Give differences between squirrel cage and slip-ring induction motors. 6.25

**Unit–IV**

8. (i) Explain different types of wiring with reference to their field of application, advantages and disadvantages. 6.25

(ii) Explain the construction and working principle of a dynamo-meter-type wattmeter and show how its deflecting force is proportional to the average value of power. 6.25

9. (i) Explain ELCB, MCB, MCCB, fuse. 6.25

(ii) Describe a PMMC instrument in detail. Further, discuss its advantage and disadvantages. 6.25