R-20 Code: 20SH1104

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024

I B.Tech. I Semester

APPLIED CHEMISTRY
(Electronics & Communication Engineering)

Time: 3Hrs Max. Marks 60

Answer SIX Questions, Choosing ONE Question from each section
All Questions carry equal marks
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SECTION – I

1. (a) State and explain Heisenberg uncertainty principle.
   (b) Write Schrodinger wave equation? Explain the significance of ψ and $\psi 2$.

2. (a) Distinguish between bonding and anti-bonding molecular orbitals.
   (b) Construct a molecular orbital diagram for NO molecule.

SECTION – II

3. (a) Describe the crystal field theory and apply it to the octahedral complexes.
   (b) Write a brief note on coordination number and oxidation state of the complexes.

4. (a) What is doping? Explain the role of doping.
   (b) Mention the applications of carbon nanotubes.

SECTION – III

5. (a) Describe the construction of calomel electrode with neat diagram.
   (b) Write a brief notes on lithium ion batteries.

6. (a) Define electromotive force. How is it measured by potentiometric method?
   (b) Describe the working of hydrogen oxygen fuel cell.

SECTION – IV

7. (a) What is differential aeration corrosion? Explain with example.
   (b) Explain the factors which influence corrosion.

8. (a) Explain sacrificial anode method in detail.
   (b) Write a brief note on electroplating with example.

SECTION – V

9. (a) Define polymerisation. Classify the types of polymerisation with examples.

   (b) Distinguish between thermoplastics and thermosetting plastics.

10. (a) Explain the preparation and properties of Nylon.

    (b) Describe the preparation of Buna S and Buna N. Mention its applications.

SECTION – VI

11. (a) Discuss the characteristics of good fuel.

    (b) Give the classification of coal. Explain the proximate analysis of coal and its Significance.

12. (a) Write a brief note on octane number.

    (b) Describe the analysis of flue gas by Orsat's apparatus.

R-20 **Code: 20EE1102**

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024

I B.Tech. I Semester

BASIC ELECTRICAL ENGINEERING

(Common to CSE, IT and AI&DS)

Time: 3Hrs Max. Marks: 60

*Answer **SIX** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks

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SECTION - I

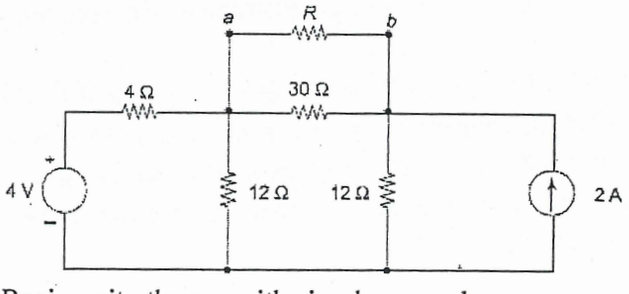
1. (a) State and explain Kirchhoff's Current Law with simple example.
   (b) Derive an expression for the equivalent resistance when the resistances are connected in parallel.

2. (a) Derive the equivalent STAR expressions for given DELTA.
   (b) Discuss about source transformation techniques.

SECTION – II

3. (a) State and explain super position theorem with simple example.
   (b) How do you use nodal analysis for an electric circuit simplification and give its significance.

4. (a) Find the Thevenin equivalent as viewed by the resistance R



   (b) State and explain Reciprocity therem with simple example.

SECTION – III

5. (a) Explain the following terms w.r.t AC circuits: i) Amplitude ii) Frequency iii) Time Period iv) Cycle v) RMS Value vi) Average value vii) Form factor
   (b) An alternating current is expressed as i=10 cos (314t-120°). Determine RMS current, frequency and instantaneous current at t =5ms.

6. (a) Determine the form factor value of a Full wave rectifier.
   (b) Calculate current, real power, reactive power, apparent power and power factor(lagging/leading) for the circuit having impedances (5+j10)ohms and (6-j15) ohms connected in parallel fed from an AC supply of 200V.

SECTION – IV

7. (a) Explain the significance of conducting OC and SC test on a Single-phase transformer.
   (b) What are the losses that occur in a transformer and how can these losses be reduced?

8. (a) Derive an expression for the e.m.f. induced in a transformer winding. Show that the e.m.f. induced per turn in primary is equal to the e.m.f. per turn in secondary.

   (b) Explain the principle of operation of a Single-phase transformer with a neat diagram and required labeling

SECTION – V

9. (a) Explain the various parts of a three phase induction motors with a neat sketch and required labeling
   (b) A three phase induction motor is wound for 4 poles and is supplied from 50Hz system, calculate
      (i) the synchronous speed
      (ii) the speed of the motor when slip is 3% and
      (iii) the rotor current frequency when the motor runs at 700 r.p.m.

10. (a) Explain the constructional of squirrel cage rotor type induction motor.
    (b) Describe the i) no-load and (ii) blocked rotor tests of an three phase induction motor.

SECTION – VI

11. (a) Describe the constructional details and working of a moving iron Attraction type meter.
    (b) Write a short note on Absolute Instrument and Secondary Instrument.

12. (a) Give the construction and principle of operation of PMMC instrument.
    (b) A PMMC instrument has a coil of dimensions 15 mm × 12 mm. The flux density in the air gap is 1.8×10^{-3} wb/m^2 and the spring constant is 0.14×10^{-6} N-m/rad. Determine the number of turns required to produce an angular deflection of 90° when a current of 5 mA is flowing through the coil.

R-20 **Code : 20SH1102**

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024

I B.Tech. I Semester

APPLIED PHYSICS

(Common to EEE, CSE, IT & AI&DS)

Time : 3Hrs Max. Marks : 60

*Answer **SIX** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks

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SECTION - I

1. (a) Interference is the phenomenon of redistribution of light energy – justify your answer.
   (b) Outline the theory of Fraunhofer diffraction by single slit and write the conditions for principal maxima and minima.

2. (a) Illustrate the essential requirements to produce a Laser.
   (b) Discuss various engineering applications of lasers.

SECTION – II

3. (a) Explain unit cell and lattice parameters of a crystal.
   (b) Demonstrate powder method of X-ray diffraction to determine the crystal structure.

4. (a) Recall the properties of ultrasonics.
   (b) Explain one of the method for detecting ultrasonic waves.

SECTION – III

5. (a) Interpret wave and particle duality.
   (b) Show that the energies of a particle in a potential box are quantized.

6. (a) Summarize the salient features of Kronig-Penny model of a crystal.
   (b) Categorize solids into conductors, semiconductors and insulators on the basis of band theory.

SECTION – IV

7. (a) Explain the variation of Fermi level with temperature in Extrinsic semiconductors with necessary diagrams.
   (b) Compare drift and diffusion currents in semiconductors with relevant expressions.

8. (a) Describe the formation of depletion region in P-N junction diode under forward and reverse bias conditions.
   (b) Explain the working of LED and write its advantages in electronic displays.

SECTION – V

9. (a) Discuss the significance of polarizability and dielectric constant of a material and how these two parameters are related with each other?

   (b) Write the applications of dielectrics.

10. (a) Explain the concept of origin of magnetism in materials.

    (b) Distinguish soft and hard magnetic materials.

SECTION – VI

11. (a) Classify Type-I & Type-II superconductors.

    (b) Explain BCS theory in superconductors.

12. (a) What are nano materials? Why surface to volume ratio is very large for nano particles compared to bulk materials?

    (b) Describe the Chemical Vapour Deposition (CVD) technique for making nano particles.

R-20 Code : 20SH1103

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024

I B.Tech. I Semester

ENGINEERING CHEMISTRY
(Common to CE & ME)

Time : 3Hrs Max. Marks : 60

*Answer **SIX** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks

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SECTION - I

1. (a) Describe the estimation of hardness by EDTA method.
   (b) Explain about (i) caustic embrittlement (ii) Priming and foaming.

2. (a) Describe the desalination of brackish water by Reverse osmosis method.
   (b) What is meant by carbonate and non-carbonate hardness of water? Explain with examples.

SECTION – II

3. (a) What are the reference electrodes? Describe the construction and working of calomel electrode.
   (b) Derive Nernst equation for the calculation of cell emf.

4. (a) Discuss about the potentiometric titrations (strong acid *vs* strong base) in brief.
   (b) Explain the principle involved in fuel cell. Describe the construction and working of hydrogen-oxygen fuel cell.

SECTION – III

5. (a) What is Pilling-Bedworth rule? Explain the significance of pilling Bedworth rule to explain the corrosion?
   (b) Define corrosion of metals. What are different types of corrosion? Explain the electrochemical theory of wet corrosion with its mechanism.

6. (a) Explain how corrosion can be controlled by cathodic protection method.
   (b) Discuss about the mechanism of metal oxide formation by dry corrosion.

SECTION – IV

7. (a) Discuss the types of polymerization with suitable examples.
   (b) What is Poly dispersity index of a polymer? Explain about the measurement of average molecular weight of polymer.

8. (a) Describe the preparation, properties and uses of (i) Buna-S-rubber (ii) Buna-N-rubber.
   (b) Explain the preparation, properties and applications of Phenol-formaldehyde.

SECTION – V

9. (a) Explain proximate analysis of coal. How is it carried out? What is its significance?

   (b) What is meant by Knocking in IC engine? Explain the mechanism of knocking in the chemical terms.

10. (a) What are Chemical fuels? Give complete classification of chemical fuels with examples.

    (b) Define calorific value of a fuel. Describe the method of determination of calorific value of solid fuel by bomb calorimeter.

SECTION – VI

11. (a) What are refractories? How are they classified? Give the essential requirements of good refractories.

    (b) Discuss any three properties and various applications of lubricants.

12. (a) Which type of cement will you recommend for the following and why?
    (i) Construction of dam (ii) lining of fire bricks in furnace (iii) oil and gas wells.

    (b) Justify- "the properties of Portland cement depends upon relative proportion of the microscopic constituents".

R-20

Code : 20CS1101

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024

I B.Tech. I Semester

PROGRAMMING FOR PROBLEM SOLVING

(Common to All Branches)

Time : 3Hrs

Max. Marks : 60

Answer SIX Questions, Choosing ONE Question from each section
All Questions carry equal marks

* * *

SECTION - I

1. (a) Write the structure of a C program.
   (b) Draw a flow chart for finding the average of n numbers.
2. (a) Write an algorithm for generating even numbers.
   (b) List out the different datatypes in C language.

SECTION – II

3. (a) Explain any five string related functions provided by C language.
   (b) How pre increment and post increment operators are used? Give an example?
4. Explain about Operator Precedence and Associativity.

SECTION – III

5. (a) Explain the different types of decision-making statements.
   (b) Write a program for finding whether number is even or odd?
6. Write a program for generating prime numbers.

SECTION – IV

7. (a) Explain about various storage classes in C.
   (b) Write a C program to search a given number in a list of numbers.
8. Write a program for finding the matrix subtraction.

SECTION – V

9. Declaration and initialization of Pointers.
10. (a) Function Prototypes.
    (b) What is recursion. Give an example program implemented using recursion.

SECTION – VI

11. Compare and contrast structure and union.
12. Write a C program to read inputs from the user and write to a file.

R-20 **Code : 20SH1105**

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024

I B.Tech. I Semester

ENGINEERING MATHEMATICS - I

(Common to All Branches)

Time : 3Hrs Max. Marks : 60

Answer SIX Questions, Choosing ONE Question from each section

All Questions carry equal marks

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SECTION - I

1. (a) Solve $(x^2y^2 + xy + 1)y\,dx + (x^2y^2 - xy + 1)x\,dy = 0$.

   (b) Solve $\frac{dy}{dx} + 2xy = e^{-x^2}$.

2. (a) A body kept in air with temperature 25^0C cools from 140^0C to 80^0C in 20 minutes. Find when the body cools down to 35^0C.

   (b) Solve $\frac{dy}{dx} + y\tan x = y^2\sec x$

SECTION – II

3. (a) Solve $(D^3 - 4D^2 - D + 4)y = e^{2x}\cos 3x$

   (b) Solve $(D^3 - D^2 - D + 1)y = 1 + x^2$.

4. Solve $(D^2 - 2D + 1)y = x^2e^{3x} - \sin 2x + 3$

SECTION – III

5. (a) Find $L\{t^2\cos 3t\}$

   (b) Find(i) $L\{e^{-3t}\sin 2t\}$, (ii) $L\{e^{2t}\cos 4t\}$.

6. (a) Find $L\left\{\frac{e^{-at} - e^{-bt}}{t}\right\}$

   (b) Evaluate $\int_0^\infty \frac{\sin t}{t}dt$

SECTION – IV

7. (a) Find $L^{-1}\left\{\frac{s\,e^{-s}}{s^2+4s+13}\right\}$

   (b) Find $L^{-1}\left\{\frac{1}{s^2(s+1)}\right\}$

8. Find $L^{-1}\left\{\frac{s^2}{(s^2+9)^2}\right\}$ using Convolution theorem

SECTION – V

9. (a) Find rank of a matrix $\begin{bmatrix} 2 & 1 & 5 & 1 \\ -1 & 2 & 5 & 3 \\ 3 & 2 & 9 & -1 \end{bmatrix}$ by reducing into Echelon form.

   (b) Solve the following system of equations, $x + y - 3z + 2w = 0$;

   $2x - y + 2z - 3w = 0$; $3x - 2y + z - 4w = 0$; $-4x + y - 3z + w = 0$.

10. Find Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

SECTION – VI

11. (a) Find the Taylors series expansion of sinx in powers of $x - \pi/4$.

(b) Obtain the Maclaurin's series expansion of $f(x) = tanx$.

12. Find the maximum value of $x^m.y^n.z^p$, given that $x + y + z = a$.

R-20 **Code : 20EE1101**

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024

I B.Tech. I Semester

BASIC ELECTRICAL SCIENCES

(Electrical & Electronics Engineering)

Time : 3Hrs Max. Marks : 60

*Answer **SIX** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks

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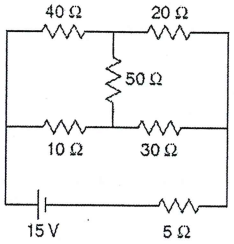
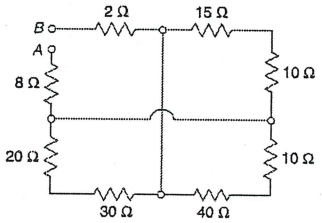
SECTION - I

1. (a) Explain the terms: Active elements and Passive elements with an examples for each.

   (b) Find the current supplied by the battery in the network shown in the figure:



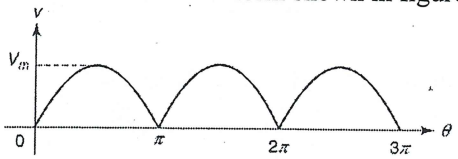
2. (a) Find the equivalent resistance between A and B in the network shown in the figure



   (b) An inductance of 3 mH has a current $i = 5\left(1 - e^{-5000t}\right)$, Find the corresponding voltage across the inductor.

SECTION – II

3. (a) Find the average value and rms value of the waveform shown in figure:



   (b) In an AC circuit source applied is 500sin100t across series combination of 10 ohms and 10 F, calculate source current flowing through circuit, form impedance and power triangle.

4. (a) Given $v = 200\sin 377t\ V$ and $i = 8\sin\left(377t - 30^o\right)\ A$, for a circuit, Determine the active power, reactive power, apparent power and power factor of the circuit.

   (b) Determine the circuit constants of a two-element series circuit if the applied voltage $v = 150\sin(5000\varpi t + 45^o)$ results in a current of $i = 3\sin(5000\varpi t - 15^o)$.

SECTION – III

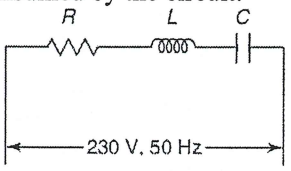
5. (a) An air-cored coil takes 5 A of current and consumes 600 W of power when connected across a 200 V, 50 Hz ac supply. Calculate the value of the current drawn by the coil if the supply frequency increases to 60 Hz.

(b) Draw the oriented graph of a network with fundamental cut-set matrix as shown below:

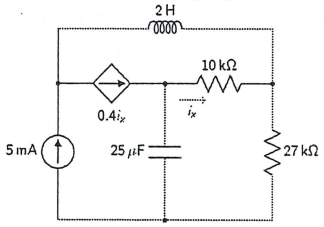
Twigs				Links		
1	2	3	4	5	6	7
1	0	0	0	-1	0	0
0	1	0	0	1	0	1
0	0	1	0	0	1	1
0	0	0	1	0	1	0

Also find number of cut-sets and draw them.

6. (a) A resistor of 20 W, inductor of 0.05 H and a capacitor of 50 mF are connected in series as shown in figure. A supply voltage 230 V, 50 Hz is connected across the series combination. Calculate the following: (a) impedance, (b) current drawn by the circuit, (c) phase difference and power factor, and (d) active and reactive power consumed by the circuit.

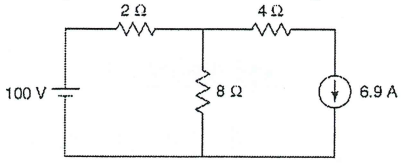


(b) For the network shown in figure, draw the oriented graph and develop the tie-set matrix.

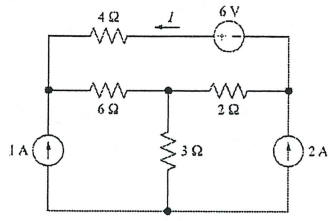


SECTION – IV

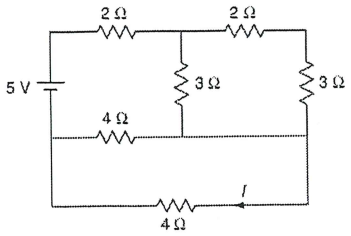
7. (a) Determine the current flowing through 8 Ohm resistor using Mesh analysis.



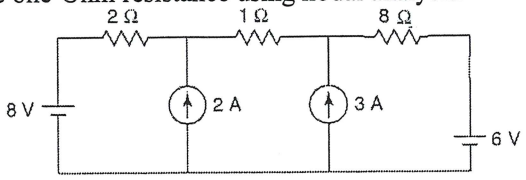
(b) Determine the current I in the circuit shown in figure using nodal analysis.



8. (a) Determine the current I shown in the figure using Mesh analysis.

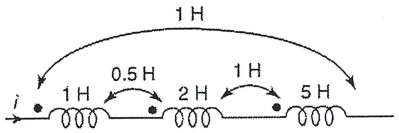


(b) Find the voltage across the one-Ohm resistance using nodal analysis.



SECTION – V

9. (a) Find the equivalent inductance of the network shown in figure:



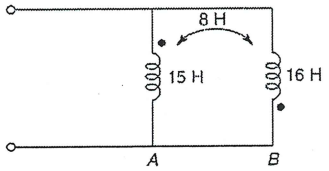
(b) Two coils having 3000 and 2000 turns are wound on a magnetic ring. 60% of the flux produced in the fi rst coil links with the second coil. A current of 3 A produce a flux of 0.5 mwb in the first coil and 0.3 mwb in the second coil. Determine the mutual inductance and coefficient of coupling.

10. (a) Two coils are mutually coupled, with L_1= 50 mH, L_2=120 mH and k=0.5. Calculate the maximum possible equivalent inductance if:

(a) the two coils are connected in series.

(b) the coils are connected in parallel.

(b) Find the equivalent inductance of the network shown in figure:



SECTION – VI

11. (a) Define the Q-factor and derive an equation showing the relation between Q-factor, Bandwidth and selectivity at resonance.

(b) Draw the current locus for a RC circuit with C=0.36 μF and variable resistance when connected across a 200 V, 50 Hz supply.

12. (a) A series RLC circuit is connected across a variable frequency supply and has R = 12 ohms, L = 1mH and C = 1000PF. Calculate resonant frequency, Q factor and cut of frequencies.

(b) Draw the current locus for a RL circuit with L=32.6 mH and variable resistance when connected across a 200 V, 50 Hz supply.