

Hall Ticket Number :

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**R-15**

**Code: 5GC12**

I B.Tech. I Semester Supplementary Examinations August 2021

**Engineering Chemistry**  
( Common to CE, ME, IT & CSE )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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**UNIT-I**

1. a) Write short notes on  
i) Scale and sludge  
ii) Caustic embrittlement 7M  
b) Discuss in brief the boiler corrosion. How is it controlled? 7M

**OR**

2. What are ionic exchange resins? Explain the ion-exchange method of softening water. Write reactions involved. Discuss the advantages of this method 14M

**UNIT-II**

3. a) What is the principle underlying conductometric titration? Discuss the titration curve obtained for a titration between HCl and NaOH. 7M  
b) Explain the construction and working of H<sub>2</sub>-O<sub>2</sub> fuel cell with neat sketch and chemical reactions 7M

**OR**

4. a) On what factors does the conductance of a solution depend? How would you proceed to determine the conductivity of a solution? 7M  
b) Explain passivity of metals. How it affects rate of corrosion 7M

**UNIT-III**

5. a) Explain the differences between thermoplastics and thermosetting plastics with examples 7M  
b) Write a brief note on Vulcanization and compounding of rubber 7M

**OR**

6. a) Why silicones are called inorganic polymers? Discuss the synthesis of linear and cross linked silicones. 7M  
b) Describe the preparation, properties and engineering applications of Buna-N rubber 7M

**UNIT-IV**

7. a) Define net and gross calorific values of a fuel. How are they determined experimentally for solid fuels? 7M  
b) A sample of Coal on analysis was found to contain the following. C = 73.0 %, H<sub>2</sub> = 3.2 %, O<sub>2</sub> = 7.0 %, S = 1.5 %, N<sub>2</sub> = 2.9 %. Calculate the quantity of air required for complete combustion of 1 kg of this coal 7M

**OR**

8. a) Write a note on synthesis of petrol from Fischer Tropsch's synthesis. 7M  
b) Explain the following  
i) Natural gas ii) Water gas iii) Biogas 7M

**UNIT-V**

9. a) What is the significance of flash & fire point, cloud & pour point of a good lubricant? 7M  
b) Write functions of lubricants 7M  
**OR**  
10. a) Describe the mechanism of extreme pressure lubrication 5M  
b) Explain the measurement and significance of the following properties of lubricant  
(i) Viscosity (ii) Aniline point (iii) Neutralization Number 9M

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**R-15**

**Code: 5GC14**  
 I B.Tech. I Semester Supplementary Examinations August 2021  
**Engineering Mathematics-I**  
 ( Common to All Branches )

Max. Marks: 70 Time: 3 Hours  
 Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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**UNIT-I**

1. a) Solve  $(x^3 y^2 + xy)dx = dy$   
 b) Find the orthogonal trajectories of the family of curve  $xy = c$

7M  
 7M

**OR**

2. a) Solve  $(1 - x^2)\frac{dy}{dx} - xy = 1$   
 b) A tank contains 5000 liters of fresh water salt water which contains 100gm of salt per liter flows into it at the rate of 10 liters per minute and the mixture kept uniform by stirring runs out at the same rate. When will the tank contain 200000gm? And how long will it take for the quantity of salt in the tank of increase from 150000gm to 250000gm?

7M  
 7M

**UNIT-II**

3. a) Solve  $(D - 2)y = 8(e^{2x} + \sin 2x + x^2)$   
 b) Using the method of variation of parameters, Solve  $\frac{d^2 y}{dx^2} + 4y = \tan 2x$

7M  
 7M

**OR**

4. a) Solve  $\frac{d^2 y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{3x}$   
 b) In an L.C.R circuit the charge  $q$  on a plate of a condenser is given by  $L\frac{d^2 q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E \sin pt$  the circuit is turned to resonance so that  $p^2 = \frac{1}{LC}$  find the current  $i$

7M  
 7M

**UNIT-III**

5. a) Verify Lagrange's Mean value theorem for  $f(x) = e^x$  in  $[0,1]$   
 b) Using Maclaurin's series, expand  $f(x) = \log(1+x)$

7M  
 7M
- OR**
6. If  $f(x) = \sin^{-1} x, 0 < a < b < 1$ , use Mean value theorem to prove that  

$$\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1} b - \sin^{-1} a < \frac{b-a}{\sqrt{1-b^2}}$$

14M

**UNIT-IV**

7. a) Find first and second partial derivatives of  $f(x, y) = ax^2 + 2hxy + by^2$  and verify  

$$\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$$
  
 b) Find the maximum and minimum values of  $f(x, y) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$

7M  
 7M

**OR**

8. a) If  $U = \log(x^3 + y^3 + z^3 - 3xyz)$  prove that  $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 U = \frac{-9}{(x+y+z)^2}$   
 b) Find the maximum and minimum values of  $f(x, y) = x^2 + y^2 + z^2$  if  $ax^2 + by^2 + cz^2 = 1$  and  $lx + my + nz = 0$

7M  
 7M

**UNIT-V**

9. Trace the curve  $r = a(1 - \cos \theta)$   
 10. Trace the curve  $r = a \cos 2\theta$

14M  
 14M

**OR**

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**R-15**

**Code: 5GC15**

I B.Tech. I Semester Supplementary Examinations August 2021

**Mathematical Methods-I**  
( Common to CSE & IT )

Max. Marks: 70
Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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**UNIT-I**

1. a) Give a brief note on the following.  
 i) Hermitian matrix. ii) Skew-Hermitian iii) Unitary matrix iv) Orthogonal matrix 8M  
 b) Find the values of a and b for which the equations  $x+ ay+ z=3$ ,  $x+2y+2z=b$ ,  $x+5y+3z=9$  will have i) no solution ii) Unique solution iii) Infinite no of solutions. 6M

**OR**

2. Define the rank of the matrix. Find the rank of the matrix

$$A = \begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix} \text{ by reducing it to normal form.}$$

14M

**UNIT-II**

3. a) Find the Eigen values and Eigen vectors of the matrix  $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$  8M  
 b) Show that if  $\lambda_1, \lambda_2, \lambda_3, \dots, \lambda_n$  latent roots of a matrix A are, then  $A^3$  has the latent roots  $\lambda_1^3, \lambda_2^3, \lambda_3^3, \dots, \lambda_n^3$  and  $k\lambda_1, k\lambda_2, k\lambda_3, \dots, k\lambda_n$  are latent roots of  $kA$ . 6M

**OR**

4. Define a model matrix, Diagonalize the Matrix  $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$  14M

**UNIT-III**

5. Reduce the quadratic form  $-3x_1^2 - 3x_2^2 - 3x_3^2 - 2x_1x_2 - 2x_1x_3 + 2x_2x_3$  to the canonical form. Find Index and Signature 14M

**OR**

6. Show that  $A = \begin{bmatrix} i & 0 & 0 \\ 0 & 0 & i \\ 0 & i & 0 \end{bmatrix}$  is a skew-Hermitian matrix and also unitary. Find Eigen values and the corresponding eigen vectors of A. 14M

**UNIT-IV**

7. a) Find a real root of the equation  $x^3 - x - 11 = 0$  by bisection method. 7M  
 b) Using Newton-Raphson method, find a positive root of  $\cos x - xe^x$ . 7M

**OR**

8. a) Find a real root of  $xe^x=3$  using Regula-Falsi method. 7M  
 b) Evaluate  $\sqrt{28}$  to four decimal places by Newton-Raphson Method 7M

**UNIT-V**

9. Using Lagrange's interpolation formula, find y(10) from the following table

X	5	6	9	11
Y	12	13	14	16

14M

**OR**

10. Evaluate  $\int_0^2 e^{-x^2} dx$  using Simpon's rule. Taking h=0.25. 14M

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Hall Ticket Number :

**R-15**

**Code: 5G111**

I B.Tech. I Semester Supplementary Examinations August 2021

**Problem Solving Techniques and C programming**

( Common to All Branches )

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT-I**

1. a) Describe computer hardware and computer software. 7M
- b) Define Algorithm. Write an Algorithm to read 20 numbers and print their sum. 7M

**OR**

2. a) Discuss briefly about computer languages. 7M
- b) Explain the software development method in detail. 7M

**UNIT-II**

3. a) Describe structure of C program with suitable example. 7M
- b) Write a program to find out total and average of three subject marks. 7M

**OR**

4. a) What is conditional operator? Write a program to enter two numbers and find the smallest out of them. Use conditional operator. 7M
- b) Explain in detail about C data types. 7M

**UNIT-III**

5. a) With Examples, explain while, do while and for loops 6M
- b) Write a program to find out whether the given number is perfect number or not. 8M

**OR**

6. Write a program to generate prime numbers between 1 and 1000. (use break statement to reduce number of iterations) 14M

**UNIT-IV**

7. a) What is an array? How is one dimensional array declared and initialized? 7M
- b) Write a program to find the sum of all elements in an array. 7M

**OR**

8. a) Discuss all string handling functions in C Language. 7M
- b) Write a program to find whether a given string is palindrome or not. 7M

**UNIT-V**

9. Explain different storage classes with examples 14M

**OR**

10. a) Explain the differences between call by value and call by reference with examples. 8M
- b) What is recursive function? Write a program to find factorial of integer value using recursive function. 6M

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