Enrolment No.	

PIMPRI CHINCHWAD UNIVERSITY

(Established Under Govt. of Maharashtra Act No. V of 2023)
Sate, Maval (PMRDA) Dist: Pune Maharashtra – 412106

Program	:	First Year B. Tech. (All)
Batch	:	2023-2024
Semester	:	Semester - I
Course	:	Engineering Chemistry
Course Code	:	CHM101
Day	:	Thursday — Maximum Marks: 60 marks
Date	:	04 Jan 2024 — Time: 2.5 hrs.

Instructions:
1. All questions are compulsory.
2. Assume missing data suitably, if any.

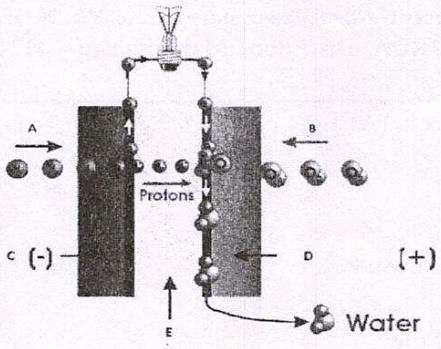
SECTION A (14 marks)
This section contains short answers.
(All questions are compulsory)

Question	BTL	CO	Marks
Q.1) a. Define the terms: i) Resistance ii) Cell constant iii) Equivalent Conductance iv) Molar Conductance	L1/L2	CO1	4
b. Explain the titration curve for conductometric titration of weak acid and weak base.	L1/L2	CO1	3
Q.2) a. Explain the mechanism of corrosion due to oxygen with respect to Na, Au, Cr & Mo metals with reactions	L1/L2	CO2	3
b. Illustrate the factors that are influencing on the rate of corrosion with respect to nature of metal.	L1/L2	CO2	4
SECTION B (16 marks) **This section contains Descriptive / Application-based questions** **Attempt any two questions**			
Q.1) a. What is a glass transition? State factors affecting on Tg.	L3/L4	CO3/CO4	4
b. Distinguish between Scales and Sludge	L3/L4	CO3/CO4	4
Q.2) a. What are quantum dots? Explain with suitable example different types of semiconductor quantum dots.	L3/L4	CO3/CO4	4
b. 25 ml of water sample requires 8.7 ml of 0.01 N H_2SO_4 upto phenolphthalein end point and further 3.3 ml upto methyl orange end point during the titration. Calculate types and amounts of alkalinity present in water.	L3/L4	CO3/CO4	4
Q.3) a. What are carbon nanotubes? Discuss the types of CNT with respect to their structure.	L3/L4	CO3/CO4	4
b. Demonstrate Reverse osmosis process with suitable diagram?	L3/L4	CO3/CO4	4

SECTION C (30 marks)

This section contains Case study / Experiential Learning / Analytics based questions

(Each question carries 15 marks) Attempt any two questions

Q.1) a.Identify following components of H_2-O_2 cell A,B,C,D,E 	L4/L5	CO5	5
b. What are the challenges of bio-ethanol production from lignocellulosic biomass and give critical analysis with a suitable diagram	L4/L5	CO5	5
c. Explain production of hydrogen gas by steam reforming of methane and coke with reaction conditions and removal of CO2.	L4/L5	CO5	5
Q.2) a. Match the following IR range with functional group IR range — Functional group 1.3300 cm^{-1} — 1. Ester 2.1730 cm^{-1} — 2. Alcohol 3.1680 cm^{-1} — 3. Acid anhydride 4.3100 cm^{-1} — 4. Carboxylic acid 5.1800 cm^{-1} — 5. Amide	L4/L5	CO6	5
b. Explain how fundamental modes of vibration of linear and non-linear molecules are calculated with examples.	L4/L5	CO6	5
c. What is the role of auxochrome in enhancing the wavelength of any molecule? Explain with any two examples.	L4/L5	CO6	5
Q.3) a. Define GCV. Draw neat labelled diagram and give working of Bomb calorimeter to determine GCV of solid fuel. State formula of GCV with corrections?	L4/L5	CO5/CO6	7
b. Identify which of the following molecule will show $\sigma \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transition only. a) Ethylene b) Acetone c) Aniline d) 2- methyl butane	L4/L5	CO5/CO6	8

Enrolment No.	20004

PIMPRI CHINCHWAD UNIVERSITY

(Established Under Govt. of Maharashtra Act No. V of 2023)

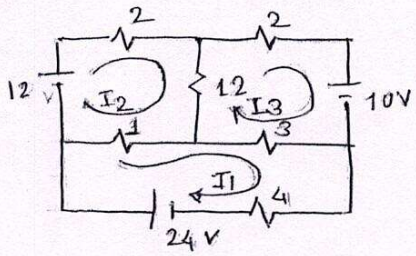
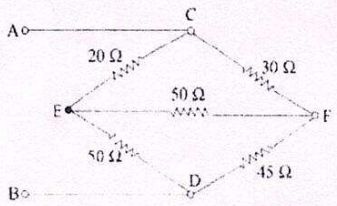
Sate, Maval (PMRDA) Dist: Pune Maharashtra – 412106

Program	:	First Year B. Tech. (All)	
Batch	:	2023-2027	
Semester	:	Semester - I	
Course	:	Basic Electrical Engineering	
Course Code	:	ELE101	
Day	:	Monday	Maximum Marks: 60 marks
Date	:	08 Jan 2024	Time: 2.5 hrs.

Instructions: - *1. All questions are compulsory.*
2. Assume missing data suitably, if any.

Section A **(Marks 14)**

This section contains short answers. (All questions are compulsory)

Q.No.	QUESTION	BTL	CO	Marks
1	a) Derive the expression for temperature Coefficient of resistance.	KL2	CO1	3
	b) For the given circuit, write the KVL equations for mesh1,2 &3 Find the mesh currents I1, I2 & I3 	KL3	CO2	4
2	a) For the given circuit, Find the Req between A-B for the circuit 	KL3	CO1	3
	b) What is the condition to transfer maximum power in D C Circuit? Derive its equation.	KL2	CO2	4

SECTION B **(Marks16)**

This section contains descriptive / Application based questions

(Attempt any two questions from three)

(Each question carries 8 marks)

1	**a)** Write a short note on BH Curve with the help of hysteresis loop. **b)** Define the following (a) Frequency (b) Phase and Phase difference (c) Time period (d) form Factor.	KL2 KL2	CO3 CO4	4 4
2	**a)** A ring shaped electromagnet has an air gap of 6mm and cross sectional area 12cm^2.The mean length of the core 60cm.Calcuate the mmf required to produce a flux density of 0.4wb/m^2 in the air gap. Take $\mu r = 400$ **b)** Define Average value and hence derive the expression for average value.	KL3 KL3	CO3 CO4	4 4
3	**a)** Derive the equation of coefficient of coupling and hence define it. What is the maximum value of coefficient of coupling? What is its unit? **b)** Prove that current lead the voltage by 90^0 for purely Capacitive circuit. Draw circuit diagram, waveforms and phasor diagram.	KL3 KL3	CO3 CO4	4 4

Section C **(Marks 30)**

This section contains Case study / Experimental learning / Analytics based questions

(Attempt any two questions from three)

(Each question carries 15 marks)

1	**a)** A single phase, 50Hz, 50KVA transformer has full load primary current of 260A and total resistance referred to primary is 0.005Ω. If the iron loss amounts to 210W. Find the efficiencies for full load at i) Unity power factor and ii) 0.8 power factor. **b)** Write a short note on Miniature Circuit Breaker (MCB). **c)** What is Earthing? Explain Plate Earthing in detail.	KL3 KL3 KL3	CO5 CO6	5 5 5
2	**a)** Derive the Expression for Star Connected Load in Three Phase System. **b)** Define the regulation of Transformer. Explain the various types of losses occurring in Transformer. **c)** Explain with the help of diagram, how Earth Leakage Circuit Breaker is used for leakage protection.	KL3 KL3 KL3	CO5 CO6	5 5 5
3	**a)** What is Fuse & explain the principle of operation of Fuse. **b)** Compare Core type & Shell type transformer. **c)** Explain the construction and working of D C Motor.	KL3 KL3 KL3	CO6 CO5	5 5 5

Enrolment No.	

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Sate, Maval (PMRDA) Dist - Pune, Maharashtra - 412 106.

End-Semester Examination – May /June - 2024

Program: F.Y.B.Tech. (All) Batch : 2023-27 Semester: II (Regular)

Maximum Marks: 60 marks Time: 2.5 hrs.

Course Name: Integral Calculus and Numerical Techniques. Course Code : UBTFY102

Course Outcomes (CO):

1. To Demonstrate ability to solve a variety of differential equations (ordinary differential equations) using appropriate methods and techniques.
2. To utilize integration techniques for solving complex integrations.
3. To determine the area, volume of various surfaces & three dimensional objects.
4. To apply vector calculus to modernized techniques in various computing systems.
5. To implement appropriate numerical techniques to approximate solutions for differential equations, optimization problems, linear algebraic equations & interpolation methods to construct approximate functions.

Instructions:

1. *All questions are compulsory.*
2. *Assume suitable and necessary data wherever required*

	Question	CO	BL	Marks
Q.1)	**Attempt ANY TWO of the following**			**(10)**
a)	Solve the following differential equations $\left(xy+2x^2y^2\right)ydx+\left(xy-x^2y^2\right)xdy=0$	**CO1**	**BL2**	**5**
b)	By using rule of DUIS, Prove that $\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x}dx=\log\left(\frac{b}{a}\right);\ a>0,\quad b>0.$	**CO2**	**BL3**	**5**
c)	Evaluate $\iint_R \frac{x^2y^2}{x^2+y^2}dxdy$ over annulus region between the circle $x^2+y^2=1$ and $x^2+y^2=4$	**CO3**	**BL3**	**5**
Q.2)	**Attempt ANY TWO of the following**			**(10)**
a)	Water at temperature $100^\circ C$ cools in 10 minutes to $88^\circ C$ in a room of temperature $25^\circ C$. Find temperature of water after 20 minutes?	**CO1**	**BL3**	**5**
b)	Evaluate : $\int_0^1 x^3\left(1-\sqrt{x}\right)^3 dx$	**CO2**	**BL3**	**5**
c)	Find the volume of cylinder $x^2+y^2=9$ intercepted by the plane $z=1$ and $z=4$.	**CO3**	**BL3**	**5**

Q.3) **Attempt ANY TWO of the following** **(10)**

a) Find the directional derivative of $\varphi = xy^2 + yz^2 - zx^2$ at the point $P(-1,3,4)$ in the direction of the line PQ where Q(1, 2, 2). **CO4 BL2 5**

b) If $\bar{F} = (3x^2 + 6y)\,\bar{i} - 14yz\,\bar{j} + 20xz^2\bar{k}$ then evaluate $\int_C \bar{F} \cdot d\bar{r}$ from $(0,0,0)$ and $(1,1,1)$ along the path C : $x = t, y = t^2, z = t^3$ **CO4 BL2 5**

c) By Stoke's theorem evaluate $\int_C \bar{F} \cdot d\bar{r}$ for $\bar{F} = 4y\,\bar{i} + 2z\,\bar{j} + 6y\,\bar{k}$ along the boundary of triangle bounded by $x = 1$, $y = 0, y = x$ **CO4 BL3 5**

Q.4) **Attempt ANY TWO of the following** **(10)**

a) Find a real root of the equation $x^3 - 2x - 5 = 0$ using secant method correct to three decimal places taking $x_0 = 2$. and $x_1 = 3$. **CO5 BL3 5**

b) Find Lagrange's interpolating polynomial passing through set of points $(0,2),(2,-2),(3,-1)$. Use it to find $x = 1.7$ and $\frac{dy}{dx}$ at x = 1. **CO5 BL3 5**

c) Given that **CO5 BL3 5**

x	0	1	2	3	4
y	1	5	25	100	250

using Newton's forward formula, find the value of y when x = 0.5.

Q.5) **Attempt ANY TWO of the following** **(10)**

a) Find the root of the equation $x - e^{-x} = 0$ that lies between 0.5 and 1 by Newton-Raphson method correct to four decimal places. **CO5 BL3 5**

b) Find the area bounded by the curve $f(x) = \frac{1}{1+x}$ and the x-axis from $x = 0$ to $x = 3$ by taking 7 ordinates using Trapezoidal rule. **CO5 BL3 5**

c) Evaluate $\int_0^{\pi} \frac{\sin^2 x}{5 + 4\cos x}\,dx$, by Simpson's $\frac{3}{8}^{th}$ rule, taking $h = \frac{\pi}{6}$ **CO5 BL3 5**

Q.6) **Attempt ANY TWO of the following** **(10)**

a) Use Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule to evaluate $\int_0^{0.8} e^{-x^2}\,dx$ by taking $h = 0.1$ **CO5 BL3 5**

b) Use the Runge-Kutta fourth order method to find the value of y when $x = 0.2$, given that $\frac{dy}{dx} = y + xy;\ y(0) = 1$ [Taking h = 0.2]. **CO5 BL3 5**

c) Use modified Euler's method to find the value of y satisfying the equation $\frac{dy}{dx} = \log_e(x + y);\ y(1) = 2$ for $x = 1.2$ taking $h = 0.2$ correct up to three decimal places. **CO5 BL3 5**

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