Hall Ticket Number :										

R-20

Code: 20AC21T

I B.Tech. II Semester Supplementary Examinations February 2023

Differential Equations and Vector Calculus

(Common to all Branches)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. **Answer ALL the following short answer questions** (5 X 2 = 10M) CO BL

a) Find the P.I of $(D^2-2D+4)\,y = e^x \cos x$ CO1 L2

b) Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$ CO2 L3

c) Find the partial differential equation of all planes passing through the origin. CO3 L2

d) Find $\nabla\left(\nabla.\frac{\bar{r}}{r}\right)$ CO4 L2

e) State Stokes theorem. CO5 L3

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT–I

2. Solve $(D^2-4D+4)\,y = 8x^2 e^{2x} \sin 2x.$ 12M CO1 L3

OR

3. Solve, by the method of Variation of Parameters, $y''-2y'+y = e^x \log x$ 12M CO1 L3

UNIT–II

4. In an L-C-R circuit, the charge q on a plate of a condenser is given by $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E\sin pt$. The circuit is tuned to resonance so that $p^2 = 1/LC$. If initially the current i and the charge q be zero, show that, for small values of R/L, the current in the circuit at time t is given by $(Et/2L)\sin pt.$ 12M CO2 L3

OR

5. Solve $(2x-1)^2\frac{d^2y}{dx^2}+(2x-1)\frac{dy}{dx}-2y=8x^2-2x+3$ — 12M CO2 L1

UNIT–III

6. a) Form the partial differential equation by eliminating the arbitrary function from $\phi\left(\frac{y}{x},\ x^2+y^2+z^2\right)=0.$ — 6M CO3 L2

   b) Solve the partial differential equation $\frac{p}{x^2}+\frac{q}{y^2}=z.$ — 6M CO3 L3

OR

7. Use Separation of Variables to solve $4u_x+u_y=3u$ with $u(0,y)=3e^{-y}-e^{-5y}.$ — 12M CO3 L3

UNIT–IV

8. a) Find the values of a and b so that the surfaces $ax^2-byz=(a+2)x$ and $4x^2y+z^3=4$ may intersect orthogonally at the point $(1,-1,2)$. — 6M CO4 L2

   b) Show that $\frac{\bar{r}}{r^3}$ is solenoidal. — 6M CO4 L3

OR

9. a) Find constants a, b, c so that the vector $\bar{A}=(x+2y+az)\bar{i}+(bx-3y-z)\bar{j}+(4x+cy+2z)\bar{k}$ is irrotational. Also find ϕ such that $\bar{A}=\nabla\phi$ — 6M CO4 L2

   b) Prove that $\text{div curl}\,\bar{f}=0.$ — 6M CO4 L3

UNIT–V

10. Evaluate $\iint_S \bar{F}.\bar{n}\,ds$ where $\bar{F}=12x^2y\bar{i}-3yz\bar{j}+2z\bar{k}$ and S is the portion of the plane $x+y+z=1$ included in the first octant. — 12M CO5 L5

OR

11. Verify Green's theorem for $\int_c\left[(3x^2-8y^2)dx+(4y-6xy)dy\right]$ where c is the region bounded by $x=0,\ y=0$ and $x+y=1.$ — 12M CO5 L5

*** End ***

Hall Ticket Number :										

R-20

Code: 20A221T

I B.Tech. II Semester Supplementary Examinations February 2023

Electrical Circuits

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

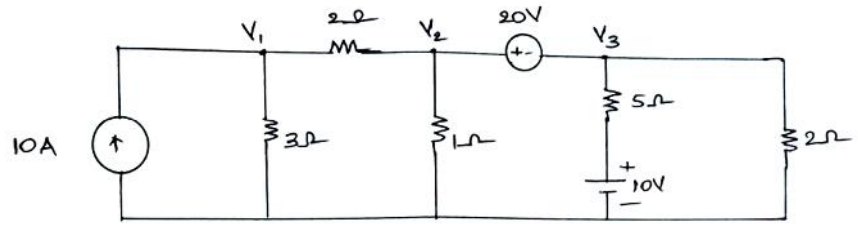
(Compulsory question)

1.	**Answer ALL the following short answer questions**	(5 X 2 = 10M)	CO	BL
a)	What is the significance of Network Topology in electrical networks?		1	L1
b)	Define Average value of an alternating quantity?		1	L1
c)	What are the possible phase sequences of three phase supply?		2	L2
d)	State Millman's theorem for DC excitation?		4	L1
e)	Define resonance for a parallel RLC circuit?		5	L1

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

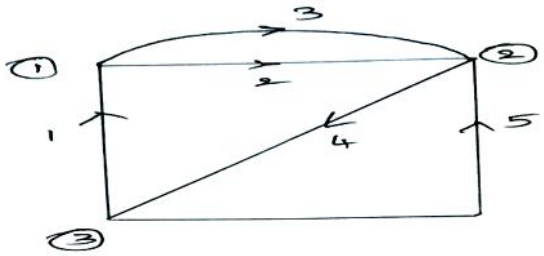
			Marks	CO	BL
		UNIT–I			
2.	a)	Analyze super mesh analysis of an electrical network with suitable example.	4M	1	L3
	b)	Determine the current flowing through 5Ω resistor in the given circuit using nodal analysis?			



8M 1 L3

OR

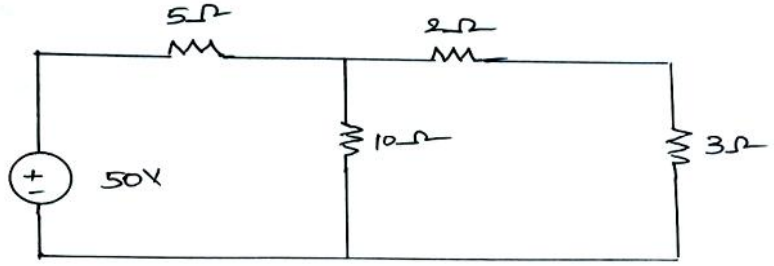
3.	a)	Explain the procedure of formulating Basic Tieset matrix?	4M	1	L4
	b)	Formulate the Basic Cutset matrix for the given connected graph?			



8M 1 L4

UNIT–II

4.	a)	List the types of AC Supply waveforms?	4M	2	L1

	b)	Determine the Average voltage and RMS voltage of a half wave rectifier circuit having V_m as the maximum value.	8M	2	L2
		OR			
5.	a)	What is the significance of power factor in electrical networks?	4M	2	L2
	b)	A Sine wave generator supplies a 50Hz, 50V RMS signal to a 10Ω resistor in series with a 0.5H inductor and 10μF capacitor. Determine the total impedance, current, phase angle, capacitive voltage, inductive voltage and resistive voltage	8M	2	L3
		UNIT–III			
6.		For a three phase delta connected system, with neat phasor diagram, prove that i) Line Current = $\sqrt{3}$ x Phase Current ii)Line Voltage= Phase Voltage	12M	4	L3
		OR			
7.		Analyze the measurement of three phase active power using two wattmeter method?	12M	4	L3
		UNIT–IV			
8.	a)	Prove that the efficiency is 50 percent while transferring the maximum power from source to load.	6M	4	L3
	b)	Explain Reciprocity theorem with suitable example?	6M	4	L2
		OR			
9.		Determine the current flowing through 3Ω resistor as shown in the given circuit using Thevenin's theorem. 	12M	4	L3
		UNIT–V			
10.		Derive the expressions for Resonance frequency, Bandwidth and quality factor for a parallel RLC circuit?	12M	5	L3
		OR			
11.	a)	Analyze the significance of Dot Convention for coupled circuits?	6M	6	L3
	b)	Two coils connected in series have an equivalent inductance of 0.4H when connected in aiding and an equivalent inductance 0.2H when the connection is opposing, Calculate the mutual inductance between the coils.	6M	6	L3

*** End ***

Hall Ticket Number :										

R-20

Code: 20A222T

I B.Tech. II Semester Supplementary Examinations February 2023

Fundamentals of Electronic Devices and Circuits

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)		CO	BL
a)	What is voltage regulation? Mention the types of voltage regulation?		CO1	L1
b)	Why the collector of transistor made larger and moderately doped?		CO2	L2
c)	Why h parameter model is important for BJT?		CO3	L2
d)	FET has lower thermal noise than BJT? Justify?		CO4	L2
e)	What are the different factors that determine the response time of photodetector?		CO5	L1

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
		UNIT–I			
2.	a)	Derive the diode current equation and explain each term involved?	6M	CO1	L2
	b)	A 100 V peak square wave with an average value of 0 V and a period of 10 ms is negatively clamped at 20 V. Draw the circuit diagram necessary for this purpose.	6M	CO1	L3
		OR			
3.	a)	With the help of a circuit diagram explain the working of two-level diode clipper?	6M	CO1	L2
	b)	For a germanium diode carrying 10 mA the required forward bias is about 0.4 V. Estimate the reverse saturation current and the bias voltage required for the currents of 1m A and 100 mA.	6M	CO1	L3
		UNIT–II			
4.	a)	With a neat diagram explain the concept of DC load line?	6M	CO2	L2
	b)	A self-bias transistor with $\beta = 100$ is used in self-biasing arrangement with $V_{CC} = 12$ V, $R_C = 4.8$ KΩ. The operating point Q is at $V_C = 8$ V, $I_C = 1.2$ mA. Find the values of R_1, R_2 and R_E.	6M	CO2	L3
		OR			
5.	a)	Draw the circuit diagram of a self-bias circuit using CE configuration and explain how it stabilizes the operating point.	6M	CO2	L2
	b)	For the fixed bias circuit $R_B = 120$ KΩ, Calculate I_B, I_C, and V_{CE} if $V_{CC} = 12$ V, $R_C = 1.1$ KΩ, and $\beta = 100$.	6M	CO2	L3

UNIT–III

6.	a)	Draw CB configuration of transistor and sketch the input and output characteristics of CB configuration?	6M	CO3	L2
	b)	The reverse leakage current of the transistor when connected in CB configuration is 0.2 mA and it is 18 μA when the same transistor is connected in CE configuration. Determine α_{dc} & β_{dc} of the transistor. Assume I_B = 30 mA.	6M	CO3	L3
		OR			
7.	a)	Draw the h-parameter equivalent circuit for a typical common emitter amplifier and derive the expression for A_i and R_i.	6M	CO3	L2
	b)	The hybrid parameters for CE amplifier are h_i =1000 Ω, h_o = 25 X 10^{-6} mhos, h_f =150, and h_r = 1.2 X 10−4. The transistor has a load resistance of 10 KΩ in collector and supplied from signal source of resistance 5 KΩ. Calculate the values of input impedance, output impedance, current gain and voltage gain.	6M	CO3	L3

UNIT–IV

8.	a)	Sketch and explain the typical shape of drain characteristics of JFET for V_{GS} = 0 with indication of four region of operation.	6M	CO4	L2
	b)	For an n-channel silicon FET with a = 3 X10^{-4} cm and N_d = 10^{15} electrons/cm^3. Evaluate (a) pinch off voltage (b) the channel half width for V_{GS} = 0.5V_P.	6M	CO4	L3
		OR			
9.	a)	Explain the working of depletion mode MOSFET. Draw and explain its VI characteristics.	6M	CO4	L2
	b)	When V_{GS} of the FEET changes from -2 V to 3V the drain Voltage changes from 1mA to 1.5 mA determine the value of transconductance.	6M	CO4	L3

UNIT–V

10.	a)	Explain the working of varactor diode.	6M	CO5	L1
	b)	The intrinsic stand –off ration for an UJT is determined to be 0.6 if the inter base resistance is 10 KΩ. What are the values of RB_1 and RB_2?	6M	CO5	L3
		OR			
11.	a)	Explain the principle of operation of photo transistors	6M	CO5	L1
	b)	Describe the working principle of SCR and draw its V-I characteristics.	6M	CO5	L1

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC23T

I B.Tech. II Semester Supplementary Examinations February 2023

Chemistry

(Common to EEE, ECE and AI&ML)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

		CO	Blooms Level
1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)		
a)	Explain ion-selective electrodes and their applications.	CO1	L2
b)	Differentiate primary batteries and secondary batteries.	CO2	L2
c)	Outline the preparation of Buna-S rubber	CO3	L4
d)	State the Beer Lambert law and define all terms in it.	CO4	L1
e)	Explain molecular machines with TWO examples.	CO5	L2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	Blooms Level
	UNIT–I			
2. a)	Define is single electrode potential. Derive Nernst equation for the determination of single electrode potential.	6M	CO1	L2
b)	Differentiate Galvanic cell and Electrolytic cell.	6M	CO1	L2
	OR			
3. a)	What is galvanic cell? Explain the determination EMF of a galvanic cell.	6M	CO1	L2
b)	Explain the construction, working and uses of glass membrane electrode.	6M	CO1	L2
	UNIT–II			
4. a)	Describe the construction, working and applications of dry cell.	6M	CO2	L2
b)	What are fuel cells? Discuss the classification and merits of fuel cells.	6M	CO2	L4
	OR			

5.	a)	Discuss the construction, working and applications of Zn-air battery.	6M	CO2	L2
	b)	Illustrate the construction working and applications of H_2-O_2 fuel cell.	6M	CO2	L4

UNIT–III

6.	a)	Differentiate thermoplastics and thermo settings.	6M	CO3	L4
	b)	Explain the preparation and uses of Bekalite.	6M	CO3	L1

OR

7.	a)	Differentiate addition polymerization and condensation polymerization..	6M	CO3	L4
	b)	Explain the conduction mechanism in poly aniline.	6M	CO3	L2

UNIT–IV

8.		Describe the working principle of Thin layer chromatography (TLC)? Write its applications	12M	CO4	L2

OR

9.	a)	Discuss the principle involved in pH metry and its applications	6M	CO4	L2
	b)	Explain the working principle and applications of UV-Vis spectroscopy	6M	CO4	L2

UNIT–V

10.	a)	Explain Catenanes as artificial molecular machines	6M	CO5	L2
	b)	Describe the linear motion in Rotaxanes	6M	CO5	L2

OR

11.		Explain about each of the following a) Cyclodextrin based molecular switches b) Displacement switching	12M	CO5	L2

*** End ***