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NMAM INSTITUTE OF TECHNOLOGY, NITTE

Off-Campus Centre of Nitte(Deemed to be University)

I Sem B.Tech. (CBCS) Mid Semester Examinations - II, November 2022

MA1002-1 – CALCULUS AND DIFFERENTIAL EQUATIONS

Duration: 1 Hour

Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

		Marks	BT*	CO*	PO*
	Unit – I				
a)	Find ∇f and $\lvert\nabla f\rvert$ at (1, 2, -1) if $f = x^3 + y^3 + z^3 + 3xyz$.	4	L*3	3	2
b)	Define solenoidal and irrotational vector field.				
	i) Determine the constant b such that $\vec{A} = (bx + 4y^2z)\hat{\imath} + (x^2 sinz - 3y)\hat{\jmath} - (e^x + 4cosx^2y)\hat{k}$ is solenoidal.				
	ii) Prove that $\vec{A} = (6xy + z^3)\hat{\imath} + (3x^2 - z)\hat{\jmath} + (3xz^2 - y)\hat{k}$ is irrotational.	6	L3	3	
a)	If $\vec{A} = 2x^2\hat{\imath} - 3yz\hat{\jmath} + xz^2\hat{k}$ and $f = 2z - x^3y$. Find $\vec{A}.\nabla f$ and $\vec{A} \times \nabla f$ at the point (1, -1,1).	6	L3	3	
b)	Find the directional derivative of $f = x^2yz + 4xz^2$ at (1, -2, -1) in the direction of the vector $2\hat{\imath} - \hat{\jmath} - 2\hat{k}$.	4	L3	3	
	Unit – II				
a)	Find extreme value of $f(x, y) = 1 - x^2 - y^2$	3	L2	2	
b)	Find particular integral of $(D^2 - 1)y = x^2$	3	L2	3	
c)	Solve $\frac{d^2x}{dt^2} + \frac{5dx}{dt} + 6x = 0$, given that $x(0) = 0, x'(0) = 15$.	4	L3	3	
a)	Solve $y'' + 4y' + 4y = 3sinx + 4cosx$.	6	L3	3	
b)	Solve $(D^2 + 3D - 4)y = 12e^{2x}$	4	L2	3	

Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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Off-Campus Centre of Nitte (Deemed to be University)

I Sem B.Tech. (CBCS) Mid Semester Examinations - II, November 2

uration: 1 Hour

CS1001-1 – PROBLEM SOLVING THROUGH PROGRAMMING

*Note: Answer any **One** full question from **each Unit.***

			Marks	BT*	Ma
		Unit – I			
	a)	Explain SWITCH statement with syntax and example.	5	L*1	
	b)	Write a C program to find the sum of all the digits and occurrence of a digit in the number.	5	L3	
2.	a)	Explain the difference between Entry-controlled and Exit-controlled loops.	5	L2	
	b)	Write a C program to find the Largest of 3 numbers.	5	L3	
		Unit – II			
3.	a)	Explain ANY 2 categories of User Defined Functions with examples.	5	L2	
	b)	Write a C program to read and display a 2-dimensional Array.	5	L3	
	a)	Explain the initialization and declaration of 1-dimensional Arrays.	5	L1	
	b)	Write a C program to perform a Linear Search for a given key integer in a single dimensional array of numbers and report Success or Failure in the form of a suitable message using functions.	5	L3	

Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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Off-Campus Centre of Nitte (Deemed to be University)

II Sem B.Tech (CBCS) Mid Semester Examinations - II, April 2023

Duration: 1 Hour

PH1001-1 – ENGINEERING PHYSICS

Max. Marks: 20

Note: Answer any ***One*** *full question from* ***each Unit.***

List of constants: Velocity of light, $c=3\times10^{8}ms^{-1}$, Planck's constant, $h=6.63\times10^{-34}$ Js, Electron mass, $m=9.11\times10^{-31}$kg, Electron charge, $e=1.6\times10^{-19}$C, Boltzmann constant, $k=1.38\times10^{-23}$J/K, Avogadro number, $N_A = 6.023\times10^{26}$/ kg mole.

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Explain the terms a) Fermi Energy, b) Mobility and c) n- type semiconductors	3	L*1	3	1,2
	b)	Obtain an expression for the conductivity of an extrinsic semiconductor.	4	L2	3	1,2
	c)	The critical temperature and critical magnetic field for superconducting lead are 7.2 K and 800 Gauss respectively. What will be the temperature up to which lead will be in superconducting state in a magnetic field of 400 Gauss?	3	L3	4	1,2
2.	a)	Explain the effect of temperature on the conductivity of an intrinsic semiconductor.	3	L1	3	1,2
	b)	Explain the properties of superconductors with suitable diagram.	4	L2	4	1,2
	c)	A semiconductor sample of thickness 1.8×10^{-4}m is placed in a magnetic field of 0.5T acting perpendicular to its thickness. Find the Hall voltage generated when a current of 200 mA passes through it. Assume the carrier concentration to be 10^{23} m^{-3}.	3	L3	3	1,2
		Unit – II				
3.	a)	Write any three difference between Direct and Indirect band gap semiconductors.	3	L1	3	1,2
	b)	What is Hall effect? Derive the expression for carrier concentration and hall coefficient in terms of mobility of the charge carries.	4	L2	3	1,2
	c)	The compound gallium arsenide has an intrinsic conductivity of 10^{-6} ohm^{-1} m^{-1} at 27 °C. How many electrons have jumped the forbidden energy gap? [Given: $\mu_e = 0.88$ $m^2V^{-1}s^{-1}$ and $\mu_h = 0.04$ $m^2V^{-1}s^{-1}$].	3	L3	3	1,2
4.	a)	Write any three difference between Type I and Type II superconductors with suitable diagrams.	3	L1	4	1
	b)	Explain Fermi factor. Discuss probability of occupancy of electrons at T = 0K, and T > 0K.	4	L2	3	1
	c)	The electrical conductivity of an intrinsic semiconductor increases from 19.96 $ohm^{-1}m^{-1}$ to 79.44 $ohm^{-1}m^{-1}$ when the temperature is increased from 60 °C to 100 °C. Find the band gap energy of the semiconductor.	3	L3	3	

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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Off-Campus Centre of Nitte (Deemed to be University)

II Sem B.Tech (CBCS) Mid Semester Examinations – II, April 2023

Duration: 1 Hour

HU1001-1 – TECHNICAL ENGLISH

*Note: Answer any **One** full question from **each Unit.***

Max. Marks: 20

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Discuss three important suggestions of Dr. Ambedkar to maintain democracy not merely in form, but also in fact.	04	L*3	03	1,4,7,8
	b)	Why is the speaker dumbfounded by the second episode of silence by the landlady in the poem 'Telephone Conversation'?	04	L2	05	2,3,6,12
	c)	Fill in the blanks with the right form of the word given in the brackets. i. Equality without liberty would kill individual _____(initiate). ii. "Can you drive?" "I am learning. My girlfriend _____(teach) me daily." "Lucky you."	02	L1	02	9,11
2.	a)	Discuss the problems of Indian democracy in light of Dr. Ambedkar's speech.	04	L3	03	1,4,7,8
	b)	Why is the colour of the speaker's skin so important to the landlady in the poem 'Telephone Conversation'?	04	L2	05	2,3,6,12
	c)	Fill in the blanks with the appropriate articles. i. He is __ university student. ii. The Sahara is ___ biggest desert in the world.	02	L1	02	9,11
		Unit- II				
1.	a)	Write an application for the following advertisement. Wanted: Software Engineer. Engineering graduates of any discipline with knowledge of C++ and Python can apply to the General Manger, Synfosys Solutions, Bengaluru 574457.	04	L5	04	2,5,11
	b)	Refute the following statement: Human beings are becoming slaves of modern technology.	04	L4	02	9,8,11
	c)	Write any two responses to a telephone call under the stage of rounding off.	02	L1	02	9,11
	a)	Senior Engineers are required for the relay stations of Preliance Lio Infocom at Bengaluru. You are Atheesh Kumar, B.E., MTech with five-year experience. Write a letter of application to The Regional Head.	04	L5	04	2,5,11
	b)	Refute the following statement: The driving age should be 21 because many kids get into road accidents.	04	L4	02	9,8,11
	c)	Write suitable expressions for each of these situations: i. You are struggling to hear the other person. ii. You have had difficulty understanding the last name of the person.	02	L1	02	9,11

T* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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Off-Campus Centre of Nitte (Deemed to be University)

II Sem B.Tech. (CBCS) Mid Semester Examinations - II, April 2023

EC1001-1 – BASIC ELECTRONICS

Duration: 1 Hour

Max. Mark

*Note: Answer any **One** full question from **each Unit.***

			Marks	BT*	CO*
		Unit – I			
1.	a)	With neat circuit diagram and relevant waveforms, explain the operation of inverting comparator with positive reference voltage.	6	L*2	3
	b)	An inverting amplifier using Op-Amp has $R_1 = 2\ K\Omega$ with a gain of $A_f = -50$. Calculate the value of the feedback resistor R_f to be connected in the circuit. Draw the circuit diagram.	4	L3	3
2.	a)	With help of a neat circuit diagram, derive the expression for the output voltage of a non-inverting amplifier. Draw the input/output waveforms.	6	L2	3
	b)	Design a summer circuit using Op-Amp for the output voltage $V_o = -3\,[0.2\,V_1 + 0.5V_2 + 2\,V_3\,]$. Given the feedback resistor as 15 $k\Omega$. Draw the circuit diagram for the same.	4	L3	3
		Unit - II			
3.	a)	With a neat circuit diagram explain the operation of Op-Amp Hartley oscillator.	6	L2	4
	b)	In an RC phase shift oscillator, $R = 1k\Omega$. If the frequency of oscillations is 5 kHz, calculate the value of C to be connected in the circuit. Draw the circuit diagram.	4	L3	4
4.	a)	With the block diagram of a voltage series feedback system, derive an expression for closed loop voltage gain.	6	L2	
	b)	Design a Colpitts oscillator whose frequency of oscillation is 40 kHz, L= 10 mH and C1 = C2 = C. Draw the circuit diagram.	4	L3	

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

Off-Campus Centre of Nitte (Deemed to be University)

II Sem B.Tech. (CBCS) Mid Semester Examinations – II, April 2023

CS1001-1 – PROBLEM SOLVING THROUGH PROGRAMMING

Duration: 1 Hour

*Note: Answer any **One** full question from **each Unit.***

Max. Marks

Unit – I

		Marks	BT*	CO*
1. a)	Explain for loop with syntax and an example.	5	L*2	3
b)	Write a C program to check whether given alphabet is vowel or consonant using Switch statement.	5	L3	3
2. a)	Explain Nested if else statement with syntax and an example.	5	L2	3
b)	Write a C program to print Fibonacci series of a given number using Do-while loop.	5	L3	3

Unit - II

3. a)	Explain the following with an example program. i) Functions with arguments and with return type ii) Functions with no arguments and with return type	5	L2	4
b)	Write a C program to input N integer numbers into a single dimension array, sort them in to ascending order using selection sort technique, and then to print both the given array and the sorted array with suitable headings.	5	L3	4
a)	Explain Declaration and Initialization of One-dimensional array with syntax and example.	5	L2	4
b)	Write a C program to perform a linear search for a given key integer in a single dimensional array of numbers and report success or failure in the form of a suitable message using functions.	5	L3	4

* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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Off-Campus Centre of Nitte (Deemed to be University)

I Sem B.Tech. (CBCS) Mid Semester Examinations - II, November 202

EC1001-1 – BASIC ELECTRONICS

Duration: 1 Hour

*Note: Answer any **One** full question from **each Unit**.*

			Marks	BT*	CO	Max.
		Unit – I				
1.	a)	With the help of a neat circuit diagram and waveforms, derive the expression for the output voltage of an Non-inverting amplifier circuit using Op-Amp.	6	L*2		
	b)	Design a summer circuit using Op-Amp for the output voltage $V_o = -2\,[0.1\,V_1 + 0.5V_2 + 2\,V_3\,]$. Given the feedback resistor as $10\,k\Omega$. Draw the circuit diagram for the same.	4	L3		
2.	a)	With neat circuit diagram and relevant waveforms, explain the operation of inverting comparator with negative reference voltage.	6	L2		
	b)	For an IC timer based astable multivibrator, the duty cycle is D = 75% with f =1 kHz, R_2 = 3.6 kΩ and C = 0.1 μF. Calculate the ON period T_{ON} and the value of R_1.	4	L3		
		Unit – II				
3.	a)	With the block diagram of a voltage series feedback system, derive an expression for closed loop voltage gain.	6	L2		
	b)	In a Hartley oscillator, the frequency of oscillation is 25 kHz. If $C = 0.02\mu F$, calculate L_1 and L_2 for 20% feedback.	4	L3		
	a)	With a neat circuit diagram explain the operation of Op- Amp RC phase shift oscillator.	6	L2		
	b)	In a Colpitts oscillator, $L = 5\,mH$. Find C_1 and C_2 if the frequency of oscillation is $f = 50\,kHz$. Assume a feedback factor of 10%.	4	L3		

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PH1001-1 – ENGINEERING PHYSICS

Duration: 1 Hour | Max. Marks: 20

*Note: Answer any **One** full question from **each Unit***

List of constants: Velocity of light, $c = 3\times10^{8} ms^{-1}$, Planck's constant, $h=6.63\times10^{-34}$ Js, Electron mass, $m=9.11\times10^{-31}$kg, Electron charge, $e=1.6\times10^{-19}$C, Boltzmann constant, $k=1.38\times10^{-23}$J/K, Mass of neutron$=1.68\times10^{-27}$ Kg. Avogadro number, $N_A = 6.023\times10^{26}$/ kg mole.

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Distinguish between intrinsic and extrinsic semiconductor.	3	L*2	3	1,2
	b)	Obtain an expression for the conductivity of an extrinsic semiconductor	4	L3	3	1,2
	c)	Calculate the resistivity of intrinsic germanium if the intrinsic carrier density is 2.5×10^{19} m^{-3} assuming electron and hole mobilities of 0.38 $m^2v^{-1}s^{-1}$ and 0.18 $m^2v^{-1}s^{-1}$ respectively.	3	L3	3	1,2
2.	a)	Explain the effect of temperature on the Fermi level in a n-type semiconductor	3	L2	3	1,2
	b)	What is Fermi factor? Discuss the variation of Fermi factor for different energy levels with temperature	4	L2	3	1,2
	c)	Calculate the probability of an electron occupying an energy level 0.02 eV above the Fermi level at 200 K	3	L3	3	1,2
		Unit – II				
3.	a)	Distinguish between direct and indirect band-gap semiconductors	3	L2	4	1,2
	b)	What is Hall effect? Obtain an expression for the Hall coefficient and Hall voltage of an n-type semiconductor	4	L2	4	1,2
	c)	A semiconductor sample of thickness 1.2×10^{-4} m is placed in a magnetic field of 0.2T acting perpendicular to its thickness. Find the Hall voltage generated when a current of 100 mA passes through it. Assume the carrier concentration to be 10^{23} m^{-3}	3	L3	4	1,2
4.	a)	Explain Type-II superconductors with suitable diagrams.	3	L2	4	1,2
	b)	What are superconductors? Explain Critical magnetic field and Meissner effect in superconductors.	4	L2	4	1,2
	c)	The critical temperature and critical magnetic field for superconducting lead are 7.2 K and 800 gauss respectively. What will be the temperature up to which lead will be in superconducting state in a magnetic field of 400 gauss?	3	L3	4	1,2

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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Sections:K,L
Group II

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MA1002-1 – CALCULUS AND DIFFERENTIAL EQUATIONS

Duration: 1 Hour | Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

		Marks	BT*	CO*	PO*
	Unit – I				
1.	a) Find ∇f and $\lvert\nabla f\rvert$ at (1, 2, -1) if $f = x^3 + y^3 + z^3 + 3xyz$.	4	L*3	3	2
	b) Define solenoidal and irrotational vector field.				
	i) Determine the constant b such that $\vec{A} = (bx + 4y^2z)\hat{i} + (x^2\sin z - 3y)\hat{j} - (e^x + 4\cos x^2 y)\hat{k}$ is solenoidal.				
	ii) Prove that $\vec{A} = (6xy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (3xz^2 - y)\hat{k}$ is irrotational	6	L3	3	2
2.	a) If $\vec{A} = 2x^2\hat{i} - 3yz\hat{j} + xz^2\hat{k}$ and $f = 2z - x^3y$. Find $\vec{A}.\nabla f$ and $\vec{A} \times \nabla f$ at the point (1, -1, 1).	6	L3	3	2
	b) Find the directional derivative of $f = x^2yz + 4xz^2$ at (1, -2, -1) in the direction of the vector $2\hat{i} - \hat{j} - 2\hat{k}$.	4	L3	3	2
	Unit – II				
3.	a) Find extreme value of $f(x, y) = 1 - x^2 - y^2$	3	L2	2	2
	b) Find particular integral of $(D^2 - 1)y = x^2$	3	L2	3	2
	c) Solve $\frac{d^2x}{dt^2} + \frac{5dx}{dt} + 6x = 0$, given that $x(0) = 0, x'(0) = 15$.	4	L3	3	2
4.	a) Solve $y'' + 4y' + 4y = 3\sin x + 4\cos x$.	6	L3	3	2
	b) Solve $(D^2 + 3D - 4)y = 12e^{2x}$	4	L2	3	2

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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Sections:A,B,C,D,E,F,G
Group I

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MA1002-1 – CALCULUS AND DIFFERENTIAL EQUATIONS

Duration: 1 Hour | Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

		Marks	BT*	CO*	PO*
	Unit – I				
1. a)	Define solenoidal and irrotational vector field. Prove that $\vec{A} = (y^2 - z^2 + 3yz - 2x)\hat{i} + (3xz + 2xy)\hat{j} + (3xy - 2xz + 2z)\hat{k}$ is both solenoidal and irrotational.	6	L*3	3	2
b)	Find ∇f and $\lvert\nabla f\rvert$ at (3, -1, 2) if $f = \log(x^2 + y^2 + z^2)$.	4	L3	3	2
2. a)	If $\vec{A} = 3xyz^2\hat{i} + 2xy^3\hat{j} - x^2yz\hat{k}$ and $f = 3x^2 - yz$. Find $\vec{A}.\nabla f$ and $\nabla.\nabla f$ at (1, -1, 1).	6	L3	3	2
b)	Find the directional derivative of $f(x, y, z) = xy^2 + yz^3$ at the point (2, -1, 1) in the direction of vector $\hat{i} + 2\hat{j} + 2\hat{k}$.	4	L3	3	2
	Unit – II				
3. a)	Find the extreme value of $u = x^2 + y^2 + 6x - 12$.	3	L2	2	2
b)	Solve $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$	2	L2	3	2
c)	Solve $(D^2 + D)y = (1 - e^x)^2$	5	L3	3	2
4. a)	Find particular integral of the equation $(D - 2)^2y8(e^{2x} + sin2x + x^2)$	6	L3	3	2
b)	Solve $(D^2 + 16)y = 14cos3x$.	4	L2	3	2

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