BSM-101 Roll No. 2 0 2 1 0 4

B.Tech.

Year: I Semester: I

Major Examination-2021-2022

Subject Name: Calculus and Linear Algebra

Time : 3 hrs. **Max. Marks : 50**

Note: Attempt all questions. All questions carry equal marks.

Q.1	Attempt any five parts of the following.	Marks	CO	BL	PO	PI Code
a)	If $x = r\cos\theta,\ y = r\sin\theta$, then show that (i) $\frac{\partial r}{\partial x} = \frac{\partial x}{\partial r}$ (ii) $\frac{1}{r}\frac{\partial x}{\partial \theta} = r\frac{\partial \theta}{\partial x}$	2	6	2	1	1.1.1
b)	If $u = \sin nx + \cos nx$, then show that $u_r = n^r[1 + (-1)^r \sin 2nx]^{1/2}$, where u_r is the r^{th} differential coefficient of u w.r.t. x.	2	1	2	1	1.1.1
c)	Find the sum and product of all the Eigen values of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.	2	2	2	1	1.1.1
d)	Compute the area bounded by the parabola $y = x^2 + 2$ and the straight lines $x = 0,\ x = 1,\ x + y = 0$.	2	4	2	1	1.1.1
e)	Evaluate $\int_0^{\pi} x \sin^7 x \cos^4 x\, dx$.	2	5	2	1	1.1.1
f)	Find the directional derivative of $\frac{1}{r^3}$ in direction of $\vec{r}$, where $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$ and $r = \lvert\vec{r}\rvert$	2	4	2	1	1.1.1
g)	Show that $curl(grad\ \phi) = 0$. Here ϕ is the scalar point function.	2	4	2	1	1.1.1
Q.2	Attempt any Two parts of the following.					
a)	If u, v, w are the roots of the cubic equation $(\lambda - x)^3 + (\lambda - y)^3 + (\lambda - z)^3 = 0$ in λ, then find $\frac{\partial(u,\ v,\ w)}{\partial(x,\ y,\ z)}$.	5	6	3	1	1.1.1

b)	If $\frac{x^2}{a^2+u}+\frac{y^2}{b^2+u}+\frac{z^2}{c^2+u}=1$, then prove that $\left(\frac{\partial u}{\partial x}\right)^2+\left(\frac{\partial u}{\partial y}\right)^2+\left(\frac{\partial u}{\partial z}\right)^2=2\left(x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}\right)$.	5	2	3	1	1.1.1
c)	(i) If $u=\log(x^3+y^3+z^3-3xyz)$, show that $\left(\frac{\partial}{\partial x}+\frac{\partial}{\partial y}+\frac{\partial}{\partial z}\right)^2 u=-\frac{9}{(x+y+z)^2}$. (ii) Given $z=x^n f_1\left(\frac{y}{x}\right)+y^{-n}f_2\left(\frac{x}{y}\right)$, prove that $x^2\frac{\partial^2 z}{\partial x^2}+2xy\frac{\partial^2 z}{\partial x\partial y}+y^2\frac{\partial^2 z}{\partial y^2}+x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}=n^2 z$.	5	1	3	1	1.1.1
Q.3	Attempt any Two parts of the following.					
a)	Find the inverse of following matrix by using elementary operations $A=\begin{bmatrix}0&2&1&3\\1&1&-1&-2\\1&2&0&1\\-1&1&2&6\end{bmatrix}$	5	3	3	1	1.1.1
b)	Discuss the consistency of the following system of equations for various values of λ $2x_1-3x_2+6x_3-5x_4=3$, $x_2-4x_3+x_4=1$, $4x_1-5x_2+8x_3-9x_4=\lambda$, and if consistent, solve it.	5	3	3	1	1.1.1
c)	Diagonalize the matrix $\begin{bmatrix}3&1&-1\\-2&1&2\\0&1&2\end{bmatrix}$	5	6	3	1	1.1.1
Q.4	Attempt any Two parts of the following.					
a)	(i) Using double integration show that $\beta(m,n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. Evaluate $\iint_R (x+y)^2 dxdy$, where R is the parallelogram in the $x-y$ plane with vertices $(1,0)$,	5	5	3	1	1.1.1

	$(3,1)$, $(2,2)$, $(0,1)$ using the transformation $u=x+y$ and $v=x-2y$.					
b)	(i) Evaluate $\int_0^{\infty}\int_0^x xe^{-x^2/y}dxdy$ by changing the order of integration. a. Evaluate $\int_{-\infty}^{\infty}\cos\frac{\pi}{2}x^2\,dx$.	5	5	3	1	1.1.1
c)	(i) Find the volume and mass contained in the solid region of the positive octant of the surface $\left(\frac{x}{a}\right)^p+\left(\frac{y}{b}\right)^q+\left(\frac{z}{c}\right)^r=1$, where $p,q\ \&\ r>0$, given that density at any point $\rho(x,y,z)=k\sqrt{xyz}$.	5	5	3	1	1.1.1
Q.5	(ii) Attempt any Two parts of the following.					
a)	(i) Find the work done in moving a particle by force field $\vec{F}=3xy\hat{\imath}-5z\hat{\jmath}+10x\hat{k}$ along the curve $x=t^2$, $y=2t^2$, $z=t^3$ from $t=0$ to $t=2$. (iii) Show that the vector field $\vec{F}=(6xy+z^3)\hat{\imath}-(3x^2-z)\hat{\jmath}+(3xz^2-y)\hat{k}$ is irrotational. Find the scalar potential ϕ such that $\vec{F}=\nabla\phi$.	5	4	3	1	1.1.1
b)	(i) Verify stokes theorem for $\vec{F}=xy\hat{\imath}+xy^2\hat{\jmath}$ taken around a square having vertices $(1,1)$, $(-1,-1)$, $(1,-1)$ and $(-1,1)$ in $x-y$ plane.	5	4	3	1	1.1.1
c)	(ii) Verify Gauss's divergence theorem for $\vec{F}=(x^2-yz)\hat{\imath}+(y^2-zx)\hat{\jmath}+(z^2-xy)\hat{k}$ taken over the rectangular parallelepiped $0\le x\le a$, $0\le y\le b$ and $0\le z\le c$.	5	4	3	1	1.1.1

BSM-142

Roll No. 2 0 2 1 0 4

B.Tech. (4 Credit)

Year: 2022 Semester: 1st

Major Examination: 2021-2022

Advanced Environmental Chemistry

Max Marks: 50

Time: 3 Hrs.

Note : Attempt ALL questions. Each question carries equal marks

Q1.	Attempt any **Five parts** of the following.	Marks	CO	BL	PO	PI Code
a)	With a neat sketch and explain how nitrogen is recycled in nature?	2	4	2	1	1.2
b)	write a short note on organic pollutants.	2	1	2	2	2.3
c)	Explain Greenhouse effect.	2	2	2	1	1.2
d)	Explain the working of either cyclone separator or fabric filter. Mentioning their advantages, disadvantages and applications.	2	4	3	2	2.3
e)	What are volatile organic compounds (VOC's)? List the sources VOC's.	2	1	1	2	2.3
f)	Name and briefly explain the layers of atmosphere.	2	2	1	1	1.2
g)	What is indoor air pollution? Explain its sources and effect on human being.	2	1	1	1	1.2
Q2.	Attempt any **Two parts** of the following.					
a)	Discuss sources of water pollution and their effects.	5	2	1/2	1	1.2
b)	Explain chemical degradation of wastes and chemicals.	5	4	2	1	1.2
c)	What are the sources and effects of ocean pollution?	5	1	1	1	1.2
Q3.	Attempt any **Two parts** of the following.					
a)	List different type of water resources and its composition. Explain the qualities of potable water.	5	1	1	2	2.3
b)	Discuss different type of water pollutants.	5	2	1	1	1.2
c)	Explain photocatalytic degradation of pollutants.	5	4	2	2	2.4

Q4.	Attempt any **Two parts** of the following.					
a)	Explain various control measures of soil pollution.	5	4	1	2	2.2
b)	Define I soil II soil pollution III soil erosion.	5	1	1	1	1.2
c)	List the type of solid waste and its harmful effect.	5	4	2	2	1.2
Q5.	Attempt any Two parts of the following.					
a)	Explain the composting technique and its advantages and disadvantages.	5	2	2	2	2.4
b)	Define the following terms I. municipal solid waste II. Hazardous waste	5	1	2	1	2.3
c)	Explain wastewater treatment/sewage treatment.	5	4	2	1	2.4

Sub Code: BEE-101

Roll No.

B. Tech

Year: 1st Semester: 1st

Major Examination: 2021-22

Fundamental of Basic Electrical

Max Marks: 50

Time: 3 Hrs.

Note: Attempt ALL questions. ALL questions carry equal marks.

		Marks
1.	Attempt any **Five parts** of the following.	
a)	State and explain Kirchoff's laws.	2
b)	State Ohm's Law. Mention one limitation.	2
c)	Define RMS value and average value.	2
d)	Calculate the form factor and peak factor of square wave.	2
e)	Define open circuit test of single phase transformer.	2
f)	A 4 pole, 50 Hz, 3 phase Induction motor operates on 1440 rpm. Calculate its percentage slip?	2
g)	Draw the phasor diagram of single phase transformer for lagging load.	2
2.	Attempt any Two parts of the following.	
a)	Derive maximum power transfer theorem for resistive load and determine efficiency in case of maximum power transfer.	5
b)	State superposition theorem and calculate I_x from the Fig.1 given below using superposition. All values of resistances are in ohm.	5

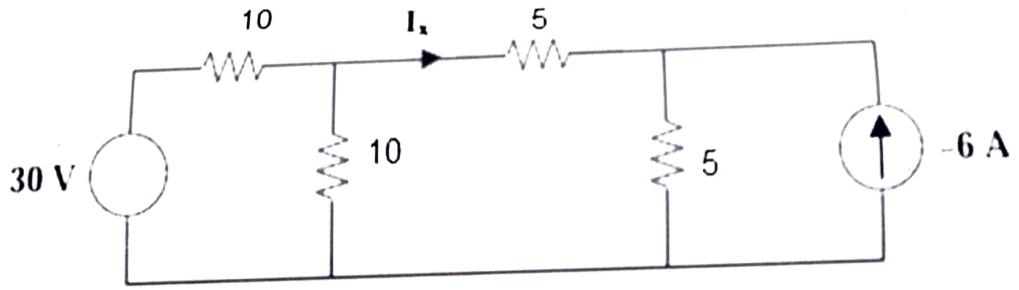

Fig.1

c)	State Norton's theorem and draw equivalent circuit. Differentiate between Thevenin's theorem and Norton's Theorem.		5
3.	Attempt any **Two parts** of the following.		
a)	The voltage across the load is $v(t)= 60 \sin(\omega t)$ and the current through the load in the direction of voltage drop is $i(t)= 1.5 \sin(\omega t+60)$ then		5
	i.	Find the complex and apparent power.	
	ii.	Find real and reactive power.	

b) In an R-L-C parallel circuit the current through the resistor, inductor (pure), and capacitor (pure) are 20A, 15A and 40A respectively. What is the Current from the supply? Draw the phasor diagram. 5

c) Define following terms in case of R-L-C series circuit: 5
   i. Resonance frequency
   ii. Band-width
   iii. Quality factor

4. Attempt any **Two parts** of the following.

a) Define following terms: 5
   i. Magnetic flux density
   ii. MMF
   iii. Reluctance

b) Explain B-H curve. Also define Hysteresis and eddy current loss with their expressions. 5

c) Explain working principle of Auto transformer. And also explain its advantages over two winding transformer. 5

5. Attempt any **Two parts** of the following.

a) Explain the working principle of DC generator. And also explain its construction with neat diagram. 5

b) Explain the working principle of single phase induction motor. And explain its classification. 5

c) Explain classification of the DC motor with their required equations and neat circuit diagrams. 5

BSM-127

Roll No. 2 0 2 1 8

B. Tech. (4 Credit Subjects)

Year: FIRST, Semester: ODD

Major Examination: 2021-2022

ENGINEERING PHYSICS

Max Marks: 50

Time: 3 Hrs.

Note: Attempt ALL questions. Each question carries equal marks

Q1.	Attempt any Five parts of the following. (All Unit)	Marks	CO	BL	PO	PI Code
a)	Define space lattice. How is it helpful to describe a crystal structure?	2	1	1	1	
b)	What is Bragg's law? In Bragg's reflection of X-rays, a reflection was found at the glancing angle of 30° with lattice planes of spacing 1.87 Å. If this is a second-order reflection, then calculate the wavelength of X-rays.	2	1	1	1	
c)	What is matter wave? A proton is moving with a speed of 2×10^8 m/s. Find the wavelength of the matter-wave associated with it. (Given that, mass of proton, $m_0 = 1.67 \times 10^{-27}$ kg)	2	2	1	1	
d)	Define wave function. What is the physical significance of wave function?	2	2	2	1	
e)	Write down Maxwell's equations in integral form. Write physical significance of each equation.	2	4	2	1	
f)	Define (i) critical transition temperature and (ii) critical field, in case of superconductors.	2	5	2	1	
g)	Describe quantum well, quantum wire, and quantum dots. Mention their important properties.	2	6	2	1	
Q2.	**Attempt any Two parts of the following. (Unit-I)**					
a)	Obtain Bragg's law for X-ray diffraction in crystals. Show how it can be experimentally verified.	5	1	2	1	
b)	What is interplanar spacing? Derive the formula for calculating interplanar spacing.	5	1	1	1	
c)	Define Miller indices. Find the perpendicular distance between the two planes having Miller indices (1, 1, 1) and (2, 2, 2) in a unit cell of a cubic lattice with lattice constant parameter a.	5	1	1	1	

Q3.	**Attempt any Two parts of the following. (Unit-II)**					
a)	What was the objective of Davisson–Germer experiment? Discuss the results of this experiment.	**5**	**2**	**2**	**1**	
b)	Derive time-dependent and time-independent Schrödinger wave equations.	**5**	**2**	**1**	**1**	
c)	A particle is moving in a one-dimensional box of width 30 Å. Calculate the probability of finding the particle within and at interval of 2 Å at the centre of the box when it is in its state of least energy.	**5**	**2**	**1**	**1**	
Q4.	**Attempt any Two parts of the following. (Unit-III)**					
a)	State Ampere's law in differential and integral forms. Discuss the modification of Ampere's law in terms of displacement current. Explain the term displacement current and give its implications.	**5**	**3**	**2**	**1**	
b)	Find out the electromagnetic wave equation from Maxwell's equation. Show that the EM wave travels with speed of light in free space.	**5**	**4**	**1**	**1**	
c)	A plane electromagnetic wave propagating along the X-direction has a wavelength of 5.0 mm. The electric field is in the Y-direction and its maximum magnitude is 48 V/m. Write the equations of the electric and magnetic fields as a function of x and t.	**5**	**4**	**1**	**1**	
Q5.	**Attempt any Two parts of the following. (Unit-IV)**					
a)	Define electrical conductivity obtain the expression of conductivity for intrinsic and extrinsic semiconductors.	**5**	**5**	**2**	**1**	
b)	Write down the characteristics and applications of superconductors. Calculate the transition temperature of niobium for which the critical field is 1×10^5 A/m at 8 K and 2×10^5A/m at 0 K.	**5**	**6**	**1**	**1**	
c)	What is nanoscience and nanotechnology? Discuss the significance of nanoscale materials.	**5**	**6**	**1**	**1**	

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating)
CO – Course Outcomes
PO – Program Outcomes
PI Code – Performance Indicator Code

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BHM-101/151

Roll No. 2 0

B.Tech (SEM I/ ODD SEMESTER)
MAJOR EXAMINATION: 2021-2022

PROFESSIONAL COMMUNICATION

Time: 2 Hrs. **Max. Marks: 50**

Note: Attempt all questions. Each question carries equal marks

Qus1 Attempt any four parts of the following. 5

(a) What are the four important aspects to be considered while planning for presentation? 5

(b) Explain the uses of tables and charts in technical writing? 5

(c) Why is posture necessary for first impression? 5

(d) Explain the importance of visuals and graphics in technical writing? 5

(e) How can you develop a paragraph adequately? 5

(f) What is a difference between comparison and contrast?

Qus2 Attempt any three parts of the following. 5

(a) Discuss the importance of non-verbal communication in context to interview? 5

(b) What is elocution? What is the importance of elocution? 5

(c) State the difference between factual and inferential comprehension? 5

(d) What is skimming and scanning? Discuss their uses briefly?

Qus3 Attempt any three parts of the following. 5

(a) What are the features of Notice? Explain its format? 5

(b) What are the salient features of resume? Draw a specimen of resume? 5

(c) What points should be considered while writing a literature review in research paper? 5

(d) Why is referencing necessary in research paper? Give two examples of referencing. 5