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NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR FALL SEMESTER
(BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY)
EXAMINATIONS 2018
BATCH 2018

Dated:06-02-2019

Time: 3 Hours **Max.Marks:60**

Differential & Integral Calculus - MT-171

Note: Attempt all questions.

Q#1:a) Do as directed. (4)

i) Prove that $\cos h(z + 2\pi i) = coshz$

ii) Find Cartesian equation of the curve representing $|z + 2| = 2\sqrt{2}$. Also sketch on argand diagram.

iii) Calculate the principal argument and modulus of $z = \frac{1}{1+i}$

iv) Find the rectangular form of $\sqrt{12}e^{\frac{i\pi}{6}}$

b) Solve $x^4 + i = 0$ OR Express $cos6x$ in terms of $cosx$. (4)

c) Show that: $\tanh^{-1} z = \frac{1}{2} log\left(\frac{1+z}{1-z}\right)$ (4)

Q#2: a) Find Maclaurian series of $\tan^{-1}(x^2)$ or e^{5x}. (4)

b) Check Continuity at x=2 of $f(x) = \begin{cases} x^2 & -2 \le x < 0 \\ 2x & 0 \le x < 2 \\ 4 - x & 2 \le x < 6 \end{cases}$ (4)

c) If $x^2y'' + xy' + y = 0$, show that $x^2y^{n+2} + (2n + 1)xy^{n+1} + (n^2 + 1)y^n = 0$ (4)

Q#3: a) Apply L Hopital to find the limit of $\lim_{x\to 0} \frac{\sqrt{1+x}-1-\left(\frac{x}{2}\right)}{x^2}$. (4)

b) Find the radius of the curvature of the cycloid $r = a(1 + cos\theta)\ at\ \theta = 0$. (4)

c) Find the relative extrema of $f(x) = \frac{1}{2}x^2 - 3x^{\frac{5}{3}}$ using second derivative test. (4)

Q#4: a) Evaluate $\int \sin^2 x \cos^2 x\, dx$ using reduction formula (4)

$$\int \sin^m u \cos^n u\, du = \frac{-sin^{m-1}ucos^{n+1}u}{m+n} + \frac{m-1}{m+n}\int sin^{m-2}ucos^n udu$$

b) Is the area under the curve $y = \frac{1}{\sqrt{x}}$ from $x = 0\ to\ x = 1$ convergent? If so, what is it? (4)

c) Determine $\int_0^{\pi/8} \sin^2 4x cos^5 4x dx$ using Beta integral. (4)

Q#5: a) A scaler field $V = x + y + z$ exists over the surface S defined by $2x + 2y + z = 2$ bounded by $x = 0, y = 0, z = 0$ in the first octant. Evaluate the surface integral $\int V\, ds$ over this surface. (6)

2.

b) Use a triple integral to evaluate $I = \iiint 3(x^2y + y^2z)dv$ bounded by the planes $x = 1, x = 3, y = -1, y = 1, z = 2, z = 4$. (6)

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SEAT NO. ____________

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR(OMPUTER SCIENCE & INFORMATION TECHNOLOGY
(SPECIALIZATION IN ARTIFICIAL INTELLIGENCE/ CYBER SECURITY)
FALL SEMESTER EXAMINATIONS 2022
BATCH 2022

Dated:02-02-2023

Time: 3 Hours **Max.Marks:60**

Differential & Integral Calculus - MT-171

NOTE: Attempt All Questions

QUESTION NO 1(a) CLO2: PLO2 : C3 **6 MARKS**

Find the centroid of the area bounded by $y = x^3$, $x = 2$ and the x-axis.

QUESTION NO 1(b) CLO2: PLO2 : C3 **6 MARKS**

A curve C, is defined by parametrically by $x = 4 \quad y = t^3 \quad z = 5 + t$ and is located within a vector field $F = yi + x^2 j + (z + x)k$.

(a)Find the coordinates of the point P on the curve where the parameter t takes the value 1.

(b) Find the coordinates of the point Q where the parameter t takes the value 3.

(c)By expressing the line integral $\int_c F.ds$ entirely in terms of t find the value of the line integral from P to Q. Note that $ds = dxi + dyj + dzk$.

QUESTION NO 2(a) CLO2: PLO2 : C3 **6 MARKS**

Evaluate by using reduction formula $\int_0^{\frac{\pi}{2}} \sin^{10} x \; dx$.

QUESTION NO 2(b) CLO2: PLO2 : C3 **6 MARKS**

Evaluate by using beta and gamma function $\int_0^{\frac{\pi}{2}} \frac{\sin^5 x}{\sqrt{\cos}} \; dx$.

QUESTION NO 3(a) CLO2: PLO2 : C3 **6 MARKS**

Find the curvature and radius of curvature of $x = t^2$, $y = t^3$ at $t = 1/2$.

QUESTION NO 3(b) CLO2: PLO2 : C3 **6 MARKS**

One side of a right angled triangle increases from 3 to 3.2 cm, other decreases from 4 to 3.96 cm. Use total differentiations to calculate the change in hypotenuse.

QUESTION NO 4(a) CLO1: PLO1 : C1 **6 MARKS**

Depict the complex no $Z = -3 - 3i$ on an argand diagram. Also convert it into polar form.

QUESTION NO 4(b) CLO1: PLO1 : C1 **6 MARKS**

If Z is complex no then prove $\sec^2 z = 1 + \tan^2 z$

QUESTION NO 5(a) CLO1: PLO1 : C1 **6 MARKS**

Use L Hospital rule to evaluate $\lim_{x \to \infty} (e^x + x)^{\frac{1}{x}}$

QUESTION NO 5(b) CLO1: PLO1 : C1 **6 MARKS**

Test the convergence /divergence of the series $\sum_{n=1}^{\infty} \frac{2^2 . 4^2 \ldots (2n+2)^2}{3^2 . 5^2 \ldots (2n+3)^2}$

SEAT NO. ______________

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR FALL SEMESTER (BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY)

EXAMINATIONS 2019

BATCH 2019

Time: 3 Hours

Dated:30-01-2020

Max.Marks:60

Differential & Integral Calculus - MT-171

NOTE: Attempt all questions.

QUESTION#01 **(05+05+03+05+05+05+02)=30 Marks)**

(a) Find the value of n such that the equation $v = r^n\,(3\cos^2\theta - 1)$ satisfies the relation.
$\frac{\partial}{\partial r}\left(r^2\,\frac{\partial v}{\partial r}\right) + \frac{1}{\sin\theta}\cdot\frac{\partial}{\partial\theta}\,(\sin\theta\,\frac{\partial v}{\partial\theta}) = 0$

(b) Show that the function $f(x,y) = x^3 + y^3 - 63\,(x+y) + 12\,xy$ is maximum at (-7,-7) and minimum at (3, 3).

(c) Apply an appropriate formula to find the radius of curvature of the cycloid
$x = a(t + \sin t), y = a(1 - \cos t)$

(d) Use Leibnitz theorem to find nth differential coefficient of $(1 - x^2)y_2 + xy_1 + y = 0$

(e) Use L'hopital rule to evaluate
(i) $\lim_{x\to 0}\frac{x\,\cos x - \ln(1+x)}{x^2}$ (ii) $\lim_{x\to 0}\frac{\ln(1+x^2)}{\sin^3 x}$

(f) Find all asymptotes of the curve $x^2y^2\,(x^2 - y^2)^2 = (x^2 + y^2)^3$.

(g) Find the value of k for which the given function is continuous
$f\,(x) = \begin{cases}\frac{x^2-9}{x-3}; & x \neq 3\\ k\ \ ; & x = 3\end{cases}$

QUESTION#02 **(05+05+05=15 Marks)**

(a) Derive reduction formula of $\int tan^n x\,dx$ and evaluate $\int tan^7\,x\,dx$

(b) Apply an appropriate method to evaluate
(i) $\int_0^{\infty}\sqrt{x}\,e^{-\sqrt[3]{x}}\,dx$ (ii) $\int_0^{\pi}\sin^6\frac{t}{2}\cos^3\frac{t}{2}\,dt$

(c) Determine the convergence or divergence of the given improper integral $\int_0^8\frac{1}{\sqrt[3]{x}}\,dx$

QUESTION#03 **(05+05+05=15 Marks)**

(a) Evaluate $\iint F.\hat{n}\,ds$ where $F = 18z\,\hat{\imath} - 12\,\hat{\jmath} + 3y\,\hat{k}$ and S is the surface of the plane $2x + 3y + 6z = 12$ bounded by the region $x = 0 \to 6\ and\ y = 0 \to \frac{12-2x}{3}$

(b) Use De Moivre's theorem to express $\sin^9\theta$ in terms of sines of multiples ofθ.

(c) Apply generalized De Moivre's theorem to find the four roots of -8+8i

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR(BACHELOR OF SCIENCE IN COMPUTER SCIENCE & INFORMATION TECHNOLOGY)
FALL SEMESTER EXAMINATIONS 2022
BATCH 2022

Time: 3 Hours | **Dated:02-02-2023**
Max.Marks:60

Differential & Integral Calculus - MT-171

-Attempt **ALL** questions. All questions carry equal marks.
-All subparts of a question should be solved in one place.
-Make sure to write question number and its subparts correctly.

CLO1	CLO2
-Question 1	-Question 2-6
-10 marks	-50 marks

Q-1:

(a) Express cos5θ and sin5θ in terms of trigonometric function series. **[3 marks]**

(b) Solve $x^3 + 1 = 0$ with the help of De Moivre's theorem. **[3 marks]**

(c) Solve the following. **[4 marks]**

(i) $\lim_{x\to\infty} \frac{(cosx)^{100}}{x^6+x^{100}+1}$ (ii) $\lim_{x\to\infty} x\cos\left(\frac{\pi}{4x}\right) Sin(\frac{\pi}{4x})$

Q-2:

(a) If $y = Ae^{-kt}cos(pt + c)$, where A, k, p and c are constant. **[5 marks]**

Prove that $y'' + 2ky' + (p^2 + k^2)y = 0$ where $y' = \frac{dy}{dt}$ and $y'' = \frac{d^2y}{dt^2}$

(b) Find series of **[5 marks]**

(i) cosx in power series of $(x - \frac{\pi}{2})$ (use taylor series)

(ii) e^x in power series of x (use maclaurin series)

Q-3:

(a) Derive the formula of $\int_0^{\frac{\pi}{2}} sin^n x dx$ by beta gamma functions and evaluate $\int_0^{\frac{\pi}{2}} sin^{11} x dx$.
[5 marks]

(b) If F = 3xy**i** – y^2**j**, Evaluate $\int_c \vec{F}\, \overrightarrow{dr}$ where c is the curve y = $2x^2$ in xy-plane from (0,0) to (1,2). **[5 marks]**

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Q-4:

(a) An open rectangular container is to have a volume of $108\ m^3$. Determine the least surface area of material required. **[5 marks]**

(b) Find gradient or divergence of following. **[5 marks]**

(i) $V = x^2yz\boldsymbol{i} - 2xy\boldsymbol{j} + yz\boldsymbol{k}$

(ii) $\Phi = 12y^2x\,cosz^2y + 2x^2z - xy$

Q-5:

(a) **Apply** double integration to find area of the region bounded by the parabola $y = x^2$ and straight line $y = x + 2$. **[3 marks]**

(b) **Apply** triple integration to evaluate $\iiint 64x^2y^3z\,dV$ over a rectangular box defined by $-1 \le x \le 2$, $0 \le y \le 3$ and $0 \le z \le 2$ **[3 marks]**

(c) Given $f(x) = 3x^4 - 2x^3 - 12x^2 + 18x + 15$, find relative extrema by using first and second derivative test, also sketch the graph. **[4 marks]**

Q-6:

(a) Find all asymptotes of each of the following. **[5 marks]**

(i) $f(x) = x^2y^2 - x^2y - xy^2 + x + y + 1$

(ii) $f(x) = \frac{1}{8-(\frac{5}{x^2})}$

(b) Prove $\int sin^n x dx = \frac{-cosx sin^{n-1}x}{n} + \frac{n-1}{n}\int sin^{n-2}x\,dx$ and evaluate $\int sin^8 x\,dx$ by using reduction formula. **[5 marks]**

GOOD LUCK!

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SEAT NO. DT-046

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR(COMPUTER SCIENCE & INFORMATION TECHNOLOGY
(SPECIALIZATION IN DATA SCIENCE)
FALL SEMESTER EXAMINATIONS 2022
BATCH 2022

Time: 3 Hours

Dated:02-02-2023
Max.Marks:60

Differential & Integral Calculus - MT-171

INSTRUCTIONS:
1. Attempt all questions.
2. Be sure to mark the question number and its subparts correctly in your answer book and all subparts are to be solved in one place.

Question No.	CLO Distribution	Total Marks
Q1	CLO 1	10
Q2	CLO 1	15
Q3	CLO 2	10
Q4	CLO 2	15
Q5	CLO 2	10

Q-1: [10 MARKS]

a) Evaluate the limit of the following:

1) $\lim_{x\to 0}(1+\sin x)^{\frac{1}{x}}$ 2) $\lim_{h\to 0}\left(\frac{(6+h)^2-36}{h}\right)$

b) sketch the graph of the following function and check the continuity:

$$f(x)=\begin{cases}-2x-4 & x<-2\\ x^2-2 & -2\le x<1\\ 2 & x\ge 1\end{cases}$$

Q-2: [15 MARKS]

a) Express $\frac{(\cos\theta+i\sin\theta)^8}{(\sin\theta+i\cos\theta)^4}$ in the form $(x+iy)$.

b) Solve $x^4+i=0$.

c) Prove that $\sin^2 z+\cos^2 z=1$

Q#3: [10 MARKS]

a) Determine the dimensions of a rectangular box, open at the top, having a volume of $32ft^3$, and requiring the least amount of material for its construction.

b) Given that $y^2=f(x)$, evaluate.

$$\frac{d}{dx}\left[y^3\frac{d^2y}{dx^2}\right]$$

Q#4: [15 MARKS]

a) Evaluate I=$\iiint_S (xz+yz)dv$, where S is bounded by the cylinder $x^2+y^2=16$ and the planes z=0 and z=3 also find the volume of S.

b) Find the area of the region R enclosed by the parabola $y=x^2$ and the line $y=x+2$.

c) Find the asymptote parallel to co-ordinates axes of the curve $4x^2+9y^2=x^2y^2$.

Q#5: [10 MARKS]

a) Evaluate $\iint_S \vec{F}\cdot\hat{n}ds$ where $\vec{F}=18z\hat{i}-12\hat{j}+3y\hat{k}$ and S is the surface of the plane $2x+3y+6z=12$ in first octant.

b) If $\vec{F}=3xy\hat{i}-y^2\hat{j}$, evaluate $\int_c \vec{F}d\vec{r}$ where c is the curve $y=2x^2$ in the xy-plane from (0,0) to (1,2).

Ms. Uroosa Baig

SEAT NO. CT-005

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR(BACHELOR OF SCIENCE IN COMPUTER SCIENCE & INFORMATION TECHNOLOGY)
FALL SEMESTER EXAMINATIONS 2021
BATCH 2021

Time: 3 Hours

Dated:08-03-2022
Max.Marks:60

Differential & Integral Calculus - MT-171

SECTION A (CLO 1)

Q.1 (a) Find the limit of the following function by using L-Hopital Rule: (5)

$$\lim_{x\to\frac{\pi}{2}}(\tan x)^{2x-\pi}$$

Q.1 (b) (5)

Determine $f(x) = \begin{cases} x^2+2x+1 & x<1 \\ 2 & x=1 \\ x^2+2 & x>1 \end{cases}$ is continuous at x=1or not?

Also sketch the graph of a given function.

SECTION B (CLO 3)

Q.2 (a) When two resistors having resistances $R_1 ohms$ and R_2 $ohms$ are connected in parallel, their combined resistance R $ohms$ is $R = \frac{R_1R_2}{(R_1+R_2)}$. (5)

Show that:

$$R_1{}^2\frac{\partial^2 R}{\partial R_1{}^2} + R_2{}^2\frac{\partial^2 R}{\partial R_2{}^2} = \frac{-4R^2}{R_1+R_2}$$

Q.2 (b) Find fourth order derivative of $f(x) = \frac{e^{2x+1}}{x}$ by using Leibnitz Theorem. (5)

OR

Apply Maclaurin's Series to show that

$$Cos\,x = \sum_{n=1}^{\infty}\frac{(-1)^{n-1}x^{(2n-2)}}{2(n-1)!}$$

Q.3 (a) Find curvature and radius of curvature $y = 2x^3 - x + 3$ at $x = 1$. (5)

Q.3 (b) Find (5)

1. The intervals on which f(x) is increasing,
2. The intervals on which f(x) is decreasing,
3. The open intervals on which f(x) is concave up,
4. The open intervals on which f(x) is concave down,
5. The x-coordinates of all inflection points.

where $f(x) = \ln\sqrt{x^2+4}$

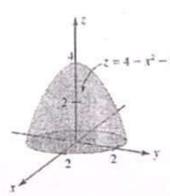
OR

Find the vertical and horizontal asymptote(s) of the given curve.

$$y = \frac{2x^2+1}{3x^2+6x}$$

Q.4 (a) Use a double integral to evaluate the volume of the solid shown in the figure. (5)

$$V = \int_{-2}^{2}\int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}}(4-x^2-y^2)\,dy\,dx$$



Q.4 (b) Evaluate the following definite integral by using the properties of Beta and Gamma functions. (5)

$$\int_0^{\frac{\pi}{4}} Sin^4\,2x\;Cos^6\,2x\;dx$$

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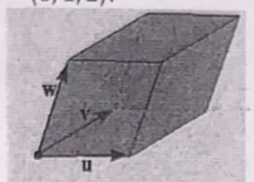
Q.5 (a) Drive Reduction formula of $\int tan^n x\, dx$ and use it to evaluate the integral (5)

$$\int_0^{\frac{\pi}{4}} tan^{10} x\, dx$$

Q.5 (b) Does the definite integral for the function $f(x) = \frac{cosx}{\sqrt{1-sinx}}$ for the limits 0 to $\frac{\pi}{2}$ converge or diverge? If it converges, find the value. (5)

SECTION C (CLO 5)

Q.6 (a) Find the volume of the parallelepiped determined by scalar triple product of **w**, **u** and **v**. where $u = \langle 4, 2, -5\rangle, v = \langle 1, 3, -7\rangle$ *and* $w = \langle 6, 1, 2\rangle$. (5)



Volume = | w·(uxv) |

Q.6 (b) Find the roots of the equation by using De-Moivre's theorem $1 - x + x^2 - x^3 + x^4 - x^5 = 0$. (5)

$\frac{xy}{(x+y)}$

$y \cdot \frac{x+y \cdot 1 - (x+y) 1}{(x+y)^2}$

$x+y-x-y$

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SEAT NO. ____

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR FALL SEMESTER (BACHELOR OF SCIENCE IN APPLIED PHYSICS INDUSTRIAL CHEMISTRY)
EXAMINATIONS 2019
BATCH 2019

Dated: 04-02-2020
Max. Marks: 60

Time: 3 Hours

Calculus - MT-173

NOTE: Attempt all questions.

QUESTION#01 (05+05+05+05+05+05=30 Marks)

(a) Prove that $y = f(x+at) + g(x-at)$ satisfies $\frac{\partial^2 y}{\partial t^2} = a^2\left(\frac{\partial^2 y}{\partial x^2}\right)$ where f and g are assumed to be at least twice differentiable and a is any constant.

(b) Examine the function $f(x,y) = y^2 + 4xy + 3x^2 + x^3$ for extreme values.

(c) Apply an appropriate formula to find the curvature of $x = a(\theta + \sin\theta),\ y = a(1-\cos\theta)$ at $\theta = 0$

(d) Find nth differential coefficient of $e^x . \sin^3 x$

(e) Use L'hopital rule to evaluate $\lim_{x\to 0} \frac{x\sin x - \sin ax}{x(\cos x - \cos ax)}$

(f) Find all asymptotes of the function $(x+y)(x-y)(2x-y) - 4x(x-2y) + 4x = 0$

QUESTION#02 (05+05+05=15 Marks)

(a) Derive reduction formula of $\int Cosec^n x\, dx$ and evaluate $\int csc^5 x\, dx$

(b) Apply an appropriate method to evaluate

(i) $\int_0^{\infty} x^{n-1} e^{-h^2 x^2}\, dx$ (ii) $\int_0^1 (1-x^3)^{-\frac{1}{2}}\, dx$

(c) Determine the convergence or divergence of the given improper integral $\int_{-\infty}^{\infty} \frac{dx}{(1+x^2)}$

QUESTION#03 (05+05+05=15 Marks)

(a) Evaluate $\iint F.\hat{n}\, ds$ where $F = (x+y^2)\hat{i} - 2x\,\hat{j} + 2yz\,\hat{k}$ and S is the surface of the plane $2x + y + 2z = 6$ bounded by the region $x = 0 \to 3$ and $y = 0 \to 6 - 2x$

(b) Prove that $\frac{\sin 6\theta}{\cos\theta} = 32\sin^5\theta - 32\sin^3\theta + 6\sin\theta$

(c) Apply generalized De Moivre's theorem to find the four roots of -2+2i

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SEAT NO. ______________

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

FIRST YEAR FALL SEMESTER (BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY)
EXAMINATIONS 2019
BATCH 2019

Time: 3 Hours | Dated:30-01-2020
Max.Marks:60

Differential & Integral Calculus - MT-171

NOTE: Attempt all questions.

QUESTION#01 **(05+05+03+05+05+05+02)=30 Marks)**

(a) Find the value of n such that the equation $v = r^n\,(3\cos^2\theta - 1)$ satisfies the relation.
$\frac{\partial}{\partial r}\left(r^2\,\frac{\partial v}{\partial r}\right) + \frac{1}{\sin\theta}\cdot\frac{\partial}{\partial\theta}\,(\sin\theta\,\frac{\partial v}{\partial\theta}) = 0$

(b) Show that the function $f(x,y) = x^3 + y^3 - 63\,(x+y) + 12\,xy$ is maximum at (-7,-7) and minimum at (3, 3).

(c) Apply an appropriate formula to find the radius of curvature of the cycloid
$x = a(t + \sin t), y = a(1 - \cos t)$

(d) Use Leibnitz theorem to find nth differential coefficient of $(1-x^2)y_2 + xy_1 + y = 0$

(e) Use L'hopital rule to evaluate
(i) $\lim_{x\to0}\frac{x\,\cos x - \ln(1+x)}{x^2}$ (ii) $\lim_{x\to0}\frac{\ln(1+x^2)}{\sin^3 x}$

(f) Find all asymptotes of the curve $x^2y^2\,(x^2-y^2)^2 = (x^2+y^2)^3$.

(g) Find the value of k for which the given function is continuous
$f\,(x) = \begin{cases}\frac{x^2-9}{x-3}; & x \neq 3\\ k\quad ; & x = 3\end{cases}$

QUESTION#02 **(05+05+05=15 Marks)**

(a) Derive reduction formula of $\int tan^n x\,dx$ and evaluate $\int tan^7 x\,dx$

(b) Apply an appropriate method to evaluate
(i) $\int_0^\infty \sqrt{x}\,e^{-\sqrt[3]{x}}\,dx$ (ii) $\int_0^\pi \sin^6\frac{t}{2}\cos^3\frac{t}{2}\,dt$

(c) Determine the convergence or divergence of the given improper integral $\int_0^8 \frac{1}{\sqrt[3]{x}}\,dx$

QUESTION#03 **(05+05+05=15 Marks)**

(a) Evaluate $\iint F.\hat{n}\,ds$ where $F = 18z\,\hat{\imath} - 12\,\hat{\jmath} + 3y\,\hat{k}$ and S is the surface of the plane $2x + 3y + 6z = 12$ bounded by the region $x = 0 \to 6$ and $y = 0 \to \frac{12-2x}{3}$

(b) Use De Moivre's theorem to express $\sin^9\theta$ in terms of sines of multiples of θ.

(c) Apply generalized De Moivre's theorem to find the four roots of -8+8i