USN | | | | | | | | | | |

06MAT11

First Semester B.E. Degree Examination, June/July 2011
Engineering Mathematics – I

Time: 3 hrs. Max. Marks:100

Note: *1. Answer FIVE full questions choosing at least two from each part.*
2. Answer all objective type questions only in OMR sheet page 5 of the Answer Booklet.
3. Answer to objective type questions on sheets other than OMR will not be valued.

PART – A

1 a. Select the correct answer :

i) If $y = a^{mx}$ then y_n is

A) $m \log a . a^{mx}$ B) $(m \log a)^n . a^{mx}$ C) $\log a . a^{mx}$ D) $(m \log a)^2 . a^{mx}$

ii) The n^{th} derivative of $\sin(ax + b)$ is

A) $a^n \sin(ax + b + \frac{n\pi}{2})$ B) $a^2 \sin(ax + b + \frac{n\pi}{2})$

C) $a^n \sin(ax + b + \frac{3\pi}{2})$ D) $a^n \sin(a + bx + \frac{n\pi}{2})$

iii) If ϕ be the angle between the radius vector and the tangent at any point of the curve $r = f(\theta)$ then,

A) $\cot\phi = \frac{d\theta}{dr}$ B) $\tan\phi = r\frac{d\theta}{dr}$ C) $\tan\phi = \frac{d\theta}{dr}$ D) None of these.

iv) The Pedal equation in polar coordinate system is

A) $|\phi_1 - \phi_2| = -1$ B) $r = (1 - \cos\theta)$ C) $\tan\phi = \frac{d\theta}{dr}$ D) $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$

(04 Marks)

b. Find the n^{th} derivative of $y = e^{ax}\sin(bx + c)$. **(04 Marks)**

c. If $y^{1/m} + y^{-1/m} = 2x$, prove that $(x^2 - 1)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0$ **(06 Marks)**

d. Find the angle between the curves $r = \frac{a}{1+\cos\theta}$ and $r = \frac{b}{1-\cos\theta}$. **(06 Marks)**

2 a. Select the correct answer :

i) If $u = x^y$, then $\frac{\partial^2 u}{\partial x \partial y}$ is equal to

A) $x^{x-1}(y\log x + 1)$ B) $x^{y-1}(y\log x + 1)$ C) $x^{y-1}(x\log x + 1)$ D) $x^{y-1}(y\log x - 1)$

ii) If u be a homogeneous function of degree n in a and y then

A) $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = n$ B) $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = n^2$ C) $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = nu$ D) $x\frac{\partial u}{\partial x} - y\frac{\partial u}{\partial y} = nu$

iii) If $u = x^2 + 2xy + y^2 + x + y$ then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is equal to

A) 2u B) u C) Zero D) None of these.

iv) If $x = r\cos\theta$, $y = r\sin\theta$, then $\frac{\partial(x, y)}{\partial(r, \theta)}$ is equal to

A) 1 B) r C) 1/r D) Zero **(04 Marks)**

b. If $u = x^2\tan^{-1}(y/x) - y^2\tan^{-1}(x/y)$, show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{x^2 - y^2}{x^2 + y^2}$ **(04 Marks)**

c. If $u = x^2 - y^2$, $v = 2xy$ and $x = r\cos\theta$, $y = r\sin\theta$, find $\frac{\partial(u,v)}{\partial(r,\theta)}$. **(06 Marks)**

d. In estimating the cost of a pile of bricks measured as 2m×15m×1.2m, the tape is stretched 1% beyond the standard length. If the count is 450 bricks to 1 cu.m and bricks cost Rs.530 per 1000, find the approximate error in the cost. **(06 Marks)**

3 a. Select the correct answer :

i) $\int_0^{\pi/2} \sin^n x\,dx$ is equal to

A) $\frac{n+1}{n} I_{n-2}$ B) $\frac{n+1}{n} I_{n+2}$ C) $\frac{n-1}{n} I_{n-1}$ D) $\frac{n-1}{n} I_{n-2}$

ii) $\int_0^{\pi/2} \sin^4 x \cos^2 x\,dx$ is equal to

A) $\frac{1}{16}$ B) $\frac{1}{32}$ C) $\frac{\pi}{32}$ D) $\frac{\pi}{4}$

iii) The curve $y^2(2a - x) = x^3$ is symmetrical about the

A) y – axis B) x – axis C) x and y axis D) None of these.

iv) The asymptote for the curve $r = a\sin 3\theta$ is equal to

A) $\theta = a$ B) $\theta = 3\theta$ C) $\theta = 0$ D) No asymptotes.

(04 Marks)

b. Using the reduction formula, evaluate $\int \tan^6 x\,dx$. **(04 Marks)**

c. If n is a positive integer, show that $\int_0^{2\pi} x^n \sqrt{2ax - x^2}\,dx = \frac{(2n+1)!}{(n+2)!\,n!} \cdot \frac{a^{n+2}}{2^n} \cdot \pi$ **(06 Marks)**

d. Trace the Leminiscate $a^2y^2 = x^2(a^2 - x^2)$ **(06 Marks)**

4 a. Select the correct answer :

i) Area bounded by the curve $r = f(\theta)$ and the radii vectors $\theta = \alpha$, $\theta = \beta$ is

A) $\frac{1}{2}\int r^2 d\theta$ B) $\frac{1}{2}\int r^3 d\theta$ C) $\frac{1}{2}\int_\alpha^\beta r^2 d\theta$ D) $\frac{1}{2}\int_\alpha^\beta r^3 d\theta$

ii) The length of the arc of the curve $y = f(x)$ between the points where $x = a$ and $x = b$ is

A) $\int_a^b \left[1 + \left(\frac{dy}{dx}\right)^2\right] dx$ B) $\int_a^b \sqrt{\left[1 - \left(\frac{dy}{dx}\right)^2\right]}\,dx$ C) $\int_a^b \sqrt{\left[1 + \left(\frac{dy}{dx}\right)^2\right]}\,dx$ D) $\int_a^b \sqrt{\left[1 + \left(\frac{dy}{dx}\right)\right]}\,dx$

iii) The surface area of the solid generated by the revolution about x-axis of the arc of the curve $y = f(x)$ from $x = a$ to $x = b$ is

A) $\int_{x=a}^{x=b} 2\pi y\,ds$ B) $\int_{x=a}^{x=b} 2\pi y\,dx$ C) $\int_{x=a}^{x=b} 2\pi x\,ds$ D) $\int_{x=a}^{x=b} 2\pi\,ds$

iv) $\frac{d}{d\alpha}\left[\int_a^b f(x,\alpha)\,dx\right]$ is equal to

A) $\int_b^a \frac{\partial}{\partial\alpha} f(x,\alpha)\,dx$ B) $\int_b^a \frac{d}{dx} f(x,\alpha)\,dx$ C) $\int_a^b \frac{d}{d\alpha} f(x,\alpha)\,dx$ D) $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)\,dx$ **(04 Marks)**

b. Find the entire length of the asteroid $x^{2/3} + y^{2/3} = a^{2/3}$, using the value of $\frac{dy}{dx} = \frac{y^{1/3}}{x^{1/3}}$. **(04 Marks)**

c. Find the volume of the solid generated by the revolution of the cardioid $r = a(1 + \cos\theta)$ about the initial line. **(06 Marks)**

d. Evaluate $\int_0^1 \frac{x^\alpha - 1}{\log x} dx$, $\alpha \geq 0$. **(06 Marks)**

PART – B

5 a. Select the correct answer :

i) The order of the equation $\left[1+\left(\frac{dy}{dx}\right)^2\right]^3 = c^2\left(\frac{d^2y}{dx^2}\right)^2$ is

A) 1 B) 2 C) 3 D) None of these.

ii) The standard form of a linear differential equation of the first order is

A) $\frac{dy}{dx} + y = P$ B) $\frac{dy}{dx} + Py = Q$ C) $\frac{dy}{dx} - Py = P$ D) $\frac{dy}{dx} + Qy = Q$

iii) What is the value of $\frac{\partial M}{\partial y}$, for the differential equation

$(1 + 2xy\cos x^2 - 2xy)dx + (\sin x^2 - x^2)dy = 0$

A) $2x\cos x^2 - 2x$ B) $2y\cos x^2 - 2x$ C) $2x\cos x^2 - 2y$ D) $-2x\cos x^2 - 2x$

iv) The differential equation of the family $y^2 = 4a(x + a)$ is

A) $y^2 = \frac{dy}{dx}\left(x + \frac{1}{2}y\frac{dy}{dx}\right)$ B) $y^2 = y\frac{dy}{dx}\left(x + \frac{1}{2}y\frac{dy}{dx}\right)$

C) $y^2 = 2y\frac{dy}{dx}\left(x + \frac{1}{2}y\frac{dy}{dx}\right)$ D) $y^2 = 2y\frac{dy}{dx}\left(x + y\frac{dy}{dx}\right)$ **(04 Marks)**

b. Solve $dy/dx = e^{3x-2y} + x^2e^{-2y}$ **(04 Marks)**

c. Solve $\frac{dy}{dx} + x\sin 2y = x^3\cos^2 y$ **(06 Marks)**

d. Find the orthogonal trajectories of the family of confocal conics $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$, where λ is the parameter. **(06 Marks)**

6 a. Select the correct answer :

i) The series $\frac{1}{1^P} + \frac{1}{2^P} + \frac{1}{3^P} + \ldots\ldots..$ converges if

A) $P > 0$ B) $P < 1$ C) $P > 1$ D) $P \leq 1$.

ii) In a positive term series Σu_n, if $\lim_{n\to\infty} \frac{u_{n+1}}{u_n} = \lambda$, then the series diverges for

A) $\lambda > 1$ B) $\lambda < 1$ C) $\lambda = 1$ D) $\lambda \leq 1$.

iii) The n^{th} term of the series $\left(\frac{2^2}{1^2} - \frac{2}{1}\right)^{-1} + \left(\frac{3^3}{2^3} - \frac{3}{2}\right)^{-2} + \left(\frac{4^4}{3^4} + \frac{4}{3}\right)^{-3} + \ldots\ldots\ldots\infty$ is

A) $\left[\frac{(n+1)^n}{n^{n+1}} - \frac{n+1}{n}\right]^{-n}$ B) $\left[\frac{(n+1)^{n+1}}{n^{n+1}} + \frac{n+1}{n}\right]^{-n}$ C) $\left[\frac{(n+1)^{n+1}}{n^{n+1}} - \frac{n+1}{n}\right]^{n}$ D) $\left[\frac{(n+1)^{n+1}}{n^{n+1}} - \frac{n+1}{n}\right]^{-n}$

iv) The series $\frac{2}{1^2} - \frac{3}{2^2} + \frac{4}{3^2} - \frac{5}{4^2} + \ldots\ldots\ldots$ is

A) Conditionally convergent B) Absolutely convergent

C) Divergent D) None of the above. **(04 Marks)**

b. Test the convergence of the series $\frac{1}{1.2.3}+\frac{3}{2.3.4}+\frac{5}{3.4.5}+....\frac{2n-1}{n(n+1)(n+2)}+....\infty$ **(04 Marks)**

c. Discuss the nature of the series $\frac{1}{2}+\frac{2}{3}x+\left(\frac{3}{4}\right)^2 x^2+\left(\frac{4}{5}\right)^3 x^3+.....\infty \ (x>0)$ **(06 Marks)**

d. Discuss the absolute convergence and conditional convergence of the series $\frac{5}{2}-\frac{7}{4}+\frac{9}{6}-\frac{11}{8}+.........$ **(06 Marks)**

7 a. Select the correct answer :

i) If l, m, n be the direction cosine of the normal to the plane, then the normal form of the equation of the plane is

A) ln + my + nz = 0 B) ln + my – nz = p

C) ln + my + nz = p D) None of these.

ii) Symmetrical form of the equations of the straight line through the point $A(x_1, y_1, z_1)$ and having direction cosines l, m, n are

A) $\frac{x-x_1}{l}=\frac{y-y_1}{m}=\frac{z-z_1}{n}$ B) $\frac{x+x_1}{l}=\frac{y+y_1}{m}=\frac{z+z_1}{n}$

C) $\frac{x-x_1}{lx}=\frac{y-y_1}{my}=\frac{z-z_1}{nz}$ D) lx + my + nz = 0.

iii) The equation of any plane through the line $\frac{x-x_1}{l}=\frac{y-y_1}{m}=\frac{z-z_1}{n}$ is

A) $a(x-x_1)+b(y-y_1)+c(z-z_1)=0$ where al + bm + cn = 0

B) $a(x+x_1)+b(y+y_1)+c(z+z_1)=0$ where al + bm + cn = 0

C) $(x+x_1)+(y+y_1)+(z+z_1)=0$ where al + bm + cn = 0 D) None of these.

iv) A point on the line $\frac{x+1}{2}=\frac{y-3}{3}=\frac{z}{-1}$ is

A) (1, 6, 1) B) (-1, 6, -1) C) (1, -6, 1) D) (1, 6, -1) **(04 Marks)**

b. Find the equation of the plane which passes through the point (3, -3, 1) and is parallel to the plane 2x + 3y + 5z + 6 = 0 **(04 Marks)**

c. Show that the lines $\frac{x-5}{4}=\frac{y-7}{4}=\frac{z+3}{-5}$; $\frac{x-8}{7}=\frac{y-4}{1}=\frac{z-5}{3}$ are coplanar. Find their common point and the equation of the plane on which they lie. **(06 Marks)**

d. Find the magnitude and the equations of the shortest distance between the lines $\frac{x}{2}=\frac{y}{-3}=\frac{z}{1}$ and $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$. **(06 Marks)**

8 a. Select the correct answer :

i) The velocity of the moving particle along the curve $x=t^3+1, y=t^2, z=2t+3$ is

A) $(t^3+1)i+t^2j+(2t+3)k$ B) $(t^3+1)i+2tj+(2t+3)k$

C) $3t^2i+t^2j+(2t+3)k$ D) $3t^2i+2tj+2k$

ii) The divergence of a continuously differentiable vector point function F is denoted by divF and is defined by

A) $i\frac{\partial F}{\partial x}-j\frac{\partial F}{\partial y}+k\frac{\partial F}{\partial z}$ B) $i\frac{\partial F}{\partial x}+j\frac{\partial F}{\partial y}-k\frac{\partial F}{\partial z}$ C) $i\frac{\partial F}{\partial x}-j\frac{\partial F}{\partial y}-k\frac{\partial F}{\partial z}$ D) $i\frac{\partial F}{\partial x}+j\frac{\partial F}{\partial y}+k\frac{\partial F}{\partial z}$

iii) div curl F is equal to

A) i + j + k B) 1 C) 0 D) 2.

iv) If $F=x^2+y^2+z^2$, then curl grad F is

A) – 1 B) 0 C) 1 D) 2. **(04 Marks)**

b. Find div F, where $F=\text{grad}\,(x^3+y^3+z^3-3xyz)$ **(04 Marks)**

c. Prove that curl (grad ϕ) = 0. **(06 Marks)**

d. Show that $r^{\alpha}R$ is any irrotational vector for any value of α but is solenoidal if $\alpha+3=0$ where R = xi + yj + zk and r is the magnitude of R. **(06 Marks)**

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First Semester B.E. Degree Examination, June/July 2011
Engineering Mathematics - I

Time: 3 hrs. Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Answer all objective type questions only on OMR sheet page 5 of the answer booklet.*
3. *Answer to objective type questions on sheets other than OMR will not be valued.*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART - A

1 a. i) If $y = (ax+b)^{-1}$, then y^n is **(04 Marks)**

A) $\frac{(-1)^{n-1}(n-1)!a^n}{(ax+b)^n}$ B) $\frac{(-1)^n n!a^n}{(ax+b)^{n+1}}$ C) $\frac{n!a^n}{(ax+b)^{n+1}}$ D) Zero

ii) The Taylor's theorem relates the value of the function and its

A) I^{st} order derivative B) II^{nd} order derivatives
C) Constant D) Higher order derivatives

iii) Cauchy's mean value theorem reduces to Lagrange's mean value theorem, if

A) $f(x) = g(x)$ B) $f'(c) = g'(c)$ C) $g(x) = x$ D) $f(x) = 0$

iv) To find the n^{th} derivative of a function $y = f(x)$, its (n-1) derivatives must be a

A) function of y B) function of x
C) constant D) function of x & y

b. If $\cos^{-1}\left(\frac{y}{b}\right) = \log\left(\frac{x}{n}\right)^n$ Prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + 2n^2 y_n = 0$ **(06 Marks)**

c. Verify Lagrange's mean value theorem for the function $f(x) = \log x$ in the interval [1, 2] and find the value of 'C'. **(04 Marks)**

d. Expand tanx in powers of $(x - \pi/4)$ upto third degree term. **(06 Marks)**

2 a. i) L Hospital's rule implies that each differentiation reduces the order of the infinitesimals by

A) unity B) two C) zero D) four

ii) If two curve cuts orthogonally, then angle between their tangents is equal to

A) zero B) $\pi/4$ C) $3\pi/4$ D) $\pi/2$

iii) Perpendicular distance from the pole on the tangent is equal to

A) Sin ϕ B) cos ϕ C) r sin ϕ D) r cos ϕ

iv) The value of radius of curve remains unchanged under the change of

A) ordinates B) signs C) derivatives D) none of these **(04 Marks)**

b. Evaluate $\underset{x\to 0}{Lt}\left(\frac{1}{x} - \cot x\right)$. **(04 Marks)**

c. Prove that the radius of curvature ρ at any point (x, y) on the curve $\sqrt{\frac{x}{a}} + \sqrt{\frac{y}{b}} = 1$ is given by $\rho = \frac{2(ax+by)^{3/2}}{ab}$. **(06 Marks)**

d. Find the pedal equation of the curve $\frac{2a}{r} = (1+\cos\theta)$. **(06 Marks)**

3 a. i) A partial increment corresponds to a change of one of the variables and all other variables are **(04 Marks)**

A) constant B) varying C) incremented D) decremented

ii) If $x = r\cos\theta$, $y = r\sin\theta$, the Jacobian of (x, y) with respect to (r, θ) is equal to

A) $\frac{1}{r}$ B) θ C) r D) zero

iii) The necessary conditions for f(x, y) to have a maximum or minimum at (a, b).

A) $f_x(a, b) = 0$ B) $f_y(a, b) = 0$

C) $f_{xy}(a, b) = 0$ D) $f_x(a, b) = f_y(a, b) = 0$

iv) In Lagrange's method of undetermined multipliers are cannot determine the nature of the

A) Function B) Stationary point C) Multipliers D) None of these

b. Find the extreme value of the function $f(x) = x^3 + y^3 - 3\,axy$, $a > 0$. **(06 Marks)**

c. If $u = \log(x^3 + y^3 + z^3 - 3xy)$ show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = -\frac{9}{(x+y+z)^2}$ **(06 Marks)**

d. Find the percentage error in the area of an ellipse when an error of 1% is made in measuring the major and minor axis. **(04 Marks)**

4 a. i) Any motion in which the curl of the velocity vector is zero is said to be **(04 Marks)**

A) rotational B) solenoidal C) irrotational D) conservative

ii) The directional derivative of a scalar function ϕ at any point is ______ along $\nabla\phi$.

A) minimum B) maximum C) zero D) ∞

iii) Gradient of a scalar field is a

A) constant B) scalar C) vector D) None of these

iv) If $\phi(x, y, z) = c$ is the equation of surface, then $\nabla\phi$ is ______ to the surface.

A) parallel B) normal C) inclined D) not parallel

b. Find the constants a,b, c so that the vector function

$\hat{F} = (x + 2y + az)\,\hat{i} + (bx - 3y - z)\,\hat{j} + (4x + (y + 2z)\,\hat{k}$ is irrotational **(04 Marks)**

c. Prove that grad div F = curl curl F + ∇^2 F. **(06 Marks)**

d. Show that the spherical co-ordinate system is orthogonal. **(06 Marks)**

PART - B

5 a. i) Any integral formula which express in terms of another similar integral in lower powers is called ______ formula **(04 Marks)**

A) integral B) differential C) reduction D) trigonometric

ii) If given equation contains only even powers of x, then the curve is symmetrical about

A) y – axis B) x –axis C) both axis D) None of these

iii) Surface of solid generated by revolution about x –axis of the curve y = f(x) between x = a, x = b.

A) $\int_a^b \pi y^2\, dx$ B) $\int_a^b \pi x\, dy$ C) $\int_a^b \pi r^2\, d\theta$ D) $\int_a^b 2\pi y\, ds$

iv) Leibniz's rule for differentiation under integral sign is

A) $\phi'(y) = \int_a^b \frac{\partial}{\partial y} f(x, y)dx$ B) $\phi'(y) = \int_a^b \frac{\partial}{\partial x\partial y} f(x, y)dx$

C) $\phi(y) = \int_a^b \frac{\partial}{\partial x} f(x, y)dx$ D) None of these

b. Obtain the reduction formula for $\int \cos^n x\, dx$. **(06 Marks)**

c. Evaluate $\int_0^{\pi/2} \sin^7\theta \cos^6\theta \, d\theta$. **(04 Marks)**

d. Find the volume of the solid obtained by revolving the Astraid $x^{2/3} + y^{2/3} = a^{2/3}$ about x – axis. **(06 Marks)**

6 a. i) The degree of the differential equation $\dfrac{\left[1+\left(\dfrac{dy}{dx}\right)^2\right]^{3/2}}{\dfrac{d^2y}{dx^2}} = C$ is **(04 Marks)**

A) Two B) Three C) One D) Zero

ii) Variable separable form of the equation $\dfrac{y}{x}\dfrac{dy}{dx} = \sqrt{1+x^2+y^2+x^2y^2}$ is

A) $\dfrac{\sqrt{1+y^2}}{y}dy = \dfrac{\sqrt{1+x^2}}{x}dx$ B) $\dfrac{y}{\sqrt{1+y^2}}dy = x\sqrt{1+x^2}\,dx$

C) $\sqrt{1+x^2}\,dx + \sqrt{1+y^2}\,dy$ D) $\dfrac{y}{\sqrt{1+y^2}}dy = \dfrac{x}{\sqrt{1+x^2}}dx$

iii) The integrating factor of the differential equation $x \log x \dfrac{dy}{dx} + y = \log x^2$ is

A) $\log x^2$ B) $\log x$ C) $x \log x$ D) $x \log x^2$.

iv) The differential equation $(x + x^8 + ay^2)\,dx + (y^8 - y + bxy)\,dy = 0$ is exact if b = ___

A) 4 B) 3x C) 2a D) 4a

b. Solve $\dfrac{dy}{dx} = \dfrac{y}{x - \sqrt{xy}}$. **(04 Marks)**

c. Solve $\dfrac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$. **(06 Marks)**

d. Find the orthogonal trajectories of the family of curve $r^n \cos n\theta = a^n$. **(06 Marks)**

7 a. i) The normal form of the matrix of rank r is **(04 Marks)**

A) $\begin{bmatrix} I_r & 0 \\ 0 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

ii) If rank of the coefficient matrix is equal to rank of the Augmented matrix then equations are

A) consistence B) inconsistence

C) have no solution D) have infinite number of solutions.

iii) In Gauss – elimination method coefficient matrix reduces to ____ matrix.

A) diagonal B) unit matrix C) triangular D) None of these

iv) The system of linear homogeneous equations have trivial solution if all variable are (i = 1 … n)

A) $x_i > 0$ B) $x_i < 0$ C) $x_i = 0$ D) $x_i = \infty$

b. Investigate the value of λ and μ so that the equations $2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $2x + 3y + \lambda z = \mu$ have i) unique solution ii) no solution iii) infinite number of solutions. **(06 Marks)**

c. Solve using the Gauss – Jordan method,

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 2 & -3 \\ -2 & -4 & -4 \end{bmatrix}$$

(06 Marks)

d. Find the rank of the Matrix of $A = \begin{bmatrix} 1 & 2 & 4 & 3 \\ 2 & 4 & 6 & 8 \\ 4 & 8 & 12 & 16 \\ 1 & 2 & 3 & 4 \end{bmatrix}$ **(04 Marks)**

8 a. i) Each eigen vector corresponding to a eigen value is **(04 Marks)**

A) unique B) no unique C) infinite D) None of these

ii) The sum of the eigen values of the matrix is the sum of the elements of

A) Any row B) Any column

C) diagonal D) Any row and column.

iii) A homogeneous expression of the second degree in any number of variables is called

A) linear form B) cubic form C) quadratic form D) None of these

iv) Every square matrix satisfies its own _______ equation.

A) quadratic B) cubic C) algebraic D) characteristic

b. Find the characteristics equation and eigen vector of the matrix

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$$

(06 Marks)

c. Reduce the matrix $A = \begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ to the diagonal form using characteristic equation method. **(06 Marks)**

d. Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2zy$ to the canonical form. **(04 Marks)**

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