SHRIMATI INDIRA GANDHI COLLEGE

(Nationally Accredited at ‘A’ Grade (3rd Cycle) By NAAC)

Tiruchirappalli – 2.

QUESTION BANK FOR

- B.Sc MATHEMATICS
- ALLIED MATHEMATICS

2017-2018

DEPARTMENT OF MATHEMATICS

CONTENT

S.No.5363 T **16SCCMM1**

(For candidates admitted from 2016-2017 onwards)

B.Sc DEGREE EXAMINATION,APRIL 2017

Part III-Mathematics-Major

DIFFERENTIAL CALCULUS & TRIGONOMETRY

MAX MARKS: 75 **TIME: 3HRS**

PART-A **(10×2=20)**

ANSWER ALL QUESTIONS .

1. Solve $D^n(cos^4x)$.
2. State the Leibnitz's theorem nth derivative of a product.
3. Define curvature of a curve in an interval
4. Find the co-ordinated of the centre of curvature of the curv $xy = 2\ at\ (2,1)$
5. Write down the expansion of $sinnx$
6. State the Demoivre's theorem
7. Show that $cosh^2\, x - sinh^2 x = 1$
8. Prove that $sinhx = \frac{x}{i!} + \frac{x^3}{3!} + \frac{x^5}{5!} + \cdots$
9. Find : Log(-e)
10. Find $cosec\alpha + cosec2\alpha + cosec2^2\alpha + \cdots \ldots\ldots + nterms$

PART-B **(5×5=25)**

11.b) If $y = \frac{3}{(x+1)(2x-1)}$,Find y_n.

(OR)

b) If $y = \frac{sinh^{-1}x}{\sqrt{1+x^2}}$,Prove that $(1 + x^2)y_{n+2} + (2n + 3)xy_{n+1} + ((\quad (n + 1)^2 = 0$.

12. a) Derive the Cartesian formula for the Radius of cuvature.

(OR)

b) Show that the evaluate of the cycloid $x = \alpha(\theta - sin\theta)$;

$y = \alpha(1 - cos\theta)$ is another cycloid

13.a)Prove that $cos8\theta = 128cos^8\theta - 256cos^6\theta + 160cos^4\theta - 32cos^2\theta + 1$

(OR)

b) Evaluatelim$_{x\to\frac{\pi}{2}}\left[\frac{sinx+cos2x}{cos^2x}\right]$.

14.a) Seperate Real & Imaginary parts of $\sin^{-1}(cos\theta + isin\theta)$

(OR)

b) If cos(x+iy)=cosθ+isinθ , Prove that cos2x+cosh2y=2

15.a)If $i^{1+ib} = a + ib$, $Prove\ that\ S_n = sec\theta sec2\theta + sec2\theta sec3\theta + \quad ... + n\ terms$

PART-C

Answer any three questions (3x10=30)

16. If $\left(y = \left(x + \sqrt{(1 + x^2)}\right)^m\right)$, then prove that

$(1 + x^2)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0.$

17.$Find\ the\ evaluate \quad \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

18. Show that if the perimeter of a triangle is constant,the triangle has maximum area when it is equilateral triangle.

19.Prove that $u = \log\left(\tan\frac{\pi}{4} + \frac{\theta}{2}\right)$iff $\cos hu$ =Sec θ

.20. a)Find the sum to infinity the series:

i) $cos\alpha + \frac{1}{2}\cos(\alpha + \beta) + \frac{1.3}{2.4}\cos(\alpha + 2\beta) + \cdots . \infty$

ii) $Prove\ that\ \pi = 2\sqrt{3}\left[1 - \frac{1}{3^2} + \frac{1}{5}.\frac{1}{3^2} - \frac{1}{7}.\frac{1}{3^2} + \cdots ..\right]$

S.N0 5364 T **16SCCMM2**

(For candidates admitted from 2016-1017 onwards)
B.Sc DEGRE EXAMINATON APRIL 2017
MATHEMATICS

INTEGRAL CALCULUS

PART– A(10x2=20)
Answer All questions

1. Evaluate: $\int \sin^4 x\, dx$.
2. Evaluate: $\int \frac{dx}{5+4\cos x}$.
3. Prove that $\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$.
4. Find $\int_0^{\frac{\pi}{2}} \cos^8 x\,dx$.
5. Find the area bounded by one arch of the curve y = sinax and the x-axis.
6. Write down the formula for the area bounded by the curve whose polar equations is r = f(θ).
7. Evaluate: $\int_0^a \int_0^b (x^2+y^2)dxdy$
8. Evaluate: $\int_0^a \int_0^{2\sqrt{ax}} x^2 dxdy$.
9. Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$.
10. Evaluate: $\beta(8,9)$.

PART -B(5×5=25)

Answer ALL Questions **(5×5=25)**

11. a) Evaluate: $\int \frac{3x+1}{(x-1)^2(x+3)}dx$.

(or)

b) Evaluate: $\int (3x-2)\sqrt{x^2+x+1}\,dx$.

12. a) Show that $\int_0^1 x^m (1-x)^n \, dx = \int_0^1 x^n (1-x)^m \, dx$ hence find

$\int_0^1 x \; (1-x)^4 \, dx$.

(or)

b) If $u_n = \int_0^a x^n e^{-x} \, dx$, prove that $u_n - (n + a) \, u_{n-1} + a \, (n-1) \, u_{n-2} = 0$.

13. a) Find the area of loop of the curve $y^2 = x^2 \frac{a+x}{a-x}$.

(or)

b) Find the area of the cardioid $r = a\,(1 + \cos\theta)$.

14. a) Change the order of integration and evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dxdy$.

(or)

b) Show that $\iiint x^{-1/2} \, y^{-1/2} \, z^{-1/2} (1-x-y-z) \, dx \, dy \, dz = \frac{\pi^2}{4}$.

15. a) Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.

(or)

b) Evaluate: $\int_0^1 x^m \left(\log \frac{1}{x} \right)^n dx$

PART-C(3×10=30)

Answer Any THREE questions

16. Evaluate: (a) $\int \frac{x^2}{\sqrt{x+5}} dx$, (b) $\int_0^{\frac{\pi}{2}} \frac{dx}{9\cos x + 12\sin x}$.

17. If $\int_0^{\frac{\pi}{2}} \cos^m x \cos nx \, dx = f(m,n)$, prove that

$f(m,n) = \frac{m}{m+n} f(m-1, n-1)$.

18. Find the area bounded by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$.

19. Evaluate: I = $\iiint_D xyz \, dx \, dy \, dz$ where D is the region bounded by the

positive octant of the sphere $x^2 + y^2 + z^2 = a^2$.

20. Prove that $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} \int_0^{\frac{\pi}{2}} \sqrt{\sin\theta}\, d\theta = \pi$.

S.No.4342 **16SCCMM2**

(For Candidates admitted from 2016-2017 onwards)
B.Sc DEGRE EXAMINATON NOVEMBER 2016
MATHEMATICS

INTEGRAL CALCULUS

PART– A(10x2=20)

Answer All questions

1. Evaluate: $\int \frac{x^3}{\sqrt{1-x^8}}\,dx$.

2. Evaluate: $\int \frac{dx}{\sqrt{1+x-x^2}}$.

3. Prove that $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \int_0^{\frac{\pi}{2}} \cos^n x\,dx$.

4. Find $\int_0^{\frac{\pi}{2}} \sin^7 x\,dx$.

5. Find the area bounded by one arch of the curve y = sinax and the x-axis.

6. Write down the formula for the area of the closed curve.

7. Evaluate: $\int_0^3 \int_0^2 xy\,(x+y)\,dydx$.

8. Evaluate: $\int_0^{\pi} \int_0^{a(1+\cos\theta)} r^2 \sin\theta\,dr\,d\theta$.

9. Prove that $\beta(m,n) = \beta(n,m)$.

10. Evaluate: $\int_0^{\infty} e^{-x^2}\,dx$.

PART-B(5X5=25)
Answer The following

11. a) Evaluate: $\int \frac{x+4}{6x-7-x^2}\,dx$.

(or)

b) Evaluate: $\int \frac{6x+5}{\sqrt{6+x-2x^2}}\,dx$.

12. a) Evaluate: $\int \sqrt{a^2 + x^2}\, dx$.

(or)

b) If $I_n = \int \frac{dx}{(x^2+1)^n}$, show that $2n\, I_{n+1} = (2n-1)\, I_n + \frac{x}{(x^2+1)^n}$.

13. a) Find the area of the ellipse $x^2 + 4y^2 - 6x + 8y + 9 = 0$.

(or)

b) Find the area of one loop of the curve $r = a \cos 3\theta$.

14. a) Change the order of integration and evaluate $\int_0^a \int_x^{2a-x} xy\, dxdy$.

(or)

b) Prove that $\int_0^a dx \int_0^x \frac{f'(y)\, dy}{\sqrt{(a-x)(x-y)}} = \pi\, [f(a) - f(0)]$.

15. a) Evaluate: $\int_0^{\frac{\pi}{2}} \sqrt{\tan\theta}\, d\theta$.

(or)

b) Show that $\frac{1\cdot 3\cdot 5 \cdots (2n-1)}{2\cdot 4\cdot 6 \cdots 2n} = \frac{\Gamma(n+\frac{1}{2})}{\Gamma(n+1)}$.

PART-C (3X10=30)

Answer Any Three questions

16. Evaluate: (a) $\int \frac{x^2}{(a+bx)^3}\, dx$, (b) $\int \frac{3x-2}{\sqrt{4x^2-4x-5}}\, dx$.

17. If $\int_0^{\frac{\pi}{2}} \cos^m x \sin nx\, dx = f(m,n)$, prove that

$f(m,n) = \frac{1}{m+n} + \frac{m}{m+n} f(m-1, n-1)$ and deduce that

$$f(m,n) = \frac{1}{2^{m+1}} \left[\frac{1}{1} + \frac{2^2}{2} + \frac{2^3}{3} + \ldots\ldots.. + \frac{2^m}{m} \right].$$

18. Find the area enclosed between the parabola $y = x^2$ and the straight line $2x - y + 3 = 0$.

19. Evaluate: I = $\iiint_D xyz\,dx\,dy\,dz$ where D is the region bounded by the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$.

20. Prove that $\beta(m,n) = \dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.

S.No.5366 T **16SCCMM 4**

(For candidates from 2016-2017 onwards)

B.Sc. DEGREE EXAMITION, APRIL 2017.

Part III-Mathematics -Major

Analytical geometry 3D

Time: Three hours **Maximum : 75 marks**

SECTION A-(10x2=20)

Answer ALL questions

1. If the direction cosines of a line $\frac{1}{c},\frac{1}{c},\frac{1}{c}$ then find the value of c.
2. If α,β,γ be the angles which a line makes with the positive direction of the axes, prove that $\sin^2\alpha+\sin^2\beta+\sin^2\gamma=2$.
3. What is meant by unsymmmetric form of the equation of aline?
4. Define : Skew lines.
5. Define : Sphere.
6. Show that plane $2x-2y+z+12=0$ touches the sphere $x^2+y^2+z^2-2x-4y+2z-3=0$.
7. Write down the condition for the second order homogeneous equation $ax^2+by^2+cz^2+2fyz+2gzx+2hxy=0$.
8. Find the equation of the cone of the second degree which passes through the axes.
9. Write the condition for the plane $lx+my+nz=0$ to touch the quadric cone $ax^2+by^2+cz^2+2fyz+2gzx+2hxy=0$.
10. Write down the tangent planes to a conicoid parallel to the plane $lx+my+nz=0$.

SECTION B-(5x5=25)

Answer the following

11.(a) Find the direction cosines of two lines which are determined by the relations

$$l+m-n=0, mn+6\ln-12lm=0$$.

(Or)

(b) Find the distances of the points (2,3,4) and (1,1,4) the plane $3x-6y+2z+11=0$.

12.(a) Show that the two lines $\frac{x+5}{3}=\frac{y+4}{1}=\frac{z-7}{-2}$ and $3x+2y+z-2=0=x-3y+2z-3$

are coplanar and find the equation of the plane.

(Or)

(b) Find the length of the perpendicular the point $P(5,4,-1)$ upon the line

$\frac{x-1}{2}=\frac{1}{9}y=\frac{1}{5}z$.

13.a)If r be the radius of the circle

$$x^2+y^2+z^2+2ux+2vy+2wz+d=0, lx+my+nz=0$$

Prove that $(r^2+d)(l^2+m^2+n^2)=(mw-nv)^2+(nu-lw)^2+(lv-wu)^2$

(Or)

b) Show that the planes $lx+my+nz=p$ will touch the shere

$x^2+y^2+z^2+2ux+2vy+2wz+d=0$ if

$(ul+vm+wn+p)^2=(l^2+m^2+n^2)(u^2+v^2+w^2-d)$.

14.a) Prove that the equation

$$2x^2-7y^2+2z^2-10yz-8zx-10xy+6x+12y-6z-3=0$$

represents a cone whose vertex is $\left\{\frac{1}{4},\frac{1}{2},\frac{1}{4}\right\}$.

(OR)

b)The axis of a right circular cone with the vertex at the origin makes equal angles with the co- ordinate axes .I f the equation of the cone is $4(x^2+y^2+z^2)+9(xy+yz+zx)=0$

Prove that the semi vertical angle of the cone is $cos^{-1}\left(\frac{1}{3\sqrt{3}}\right)$.

15.a)Prove that the cones $(ax^2+by^2+cz^2)=0$ and $\frac{x^2}{a}+\frac{y^2}{b}+\frac{z^2}{c}=0$ are reciprocal.

(OR)

b)Show that the plane $3x+2y+z=k$ touches the ellipsoid $3x^2+4y^2+z^2=20$ if $k=\pm 10$

find the length of the chord of contact between the two tangent planes.

PART-C (3x10=30)

Answer Any THREE Questions

16. Show that the straight lines whose direction cosines are given by the equations

$al+bm+cn=0, al^2+vm^2+wn^2=0$ are perpendicular or parallel according as

$a^2(v+w)+b^2(w+u)+c^2(u+v)=0$ or $\frac{a^2}{u}+\frac{b^2}{v}+\frac{c^2}{w}=0.$

17. Find the magnitude and the equations of the line of shortest distance between the lines

$\frac{x-8}{3}=\frac{y+9}{-16}=\frac{z-10}{7}, \frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}.$

18 .Show that the spheres $x^2+y^2+z^2=64$ and $x^2+y^2+z^2-12x+4y-6z+48=0$ touch

internally and find their point of contact.

19. Show that the equation of a right cone which passes through (2,1,3) and had its vertex at the point

(1,1,2) and axis the line $\frac{x-1}{2}=\frac{y-1}{-4}=\frac{z-2}{3}$ is

$17x^2-7y^2+ \quad 7z^2+24yz+16xy-12zx-18x-114y-28z+70=0.$

20. Find the equations of the two tangent planes of the ellipsoid $2x^2+2y^2+z^2 2$ which pass through the

lines $z=0, x+y=10.$

B.Sc DEGREE EXAMINATION,APIRL2017

DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS
SUBJECT CODE:16SCCMM4

SECTION – A (10X2=20)
ANSWER ALL THE QUESTIONS

1 P.T $(y^2 + 2x^2 y)dx + (2x^3 - xy)dy = 0$ is exact

2. Solve $y = (x-a)p - p^2$=0

3. Solve $(D^3 - 3D^2 + 4)y = 0$

4. Find the4 particular integral of $(D^3 - D^2 - D + 1)y = 1 + x^2$

5 Eliminate a and b from z= x+ a (y + b) and find partial differential equation.

6. Solve $p = y^2 q^2$

7. Solve $(D^4 - D'^4)z = 0$

8.Find the particular integral of $(D^2 - D'^2)z = e^{x+y}$

9.Find $L(t \sin at)$

10.Find $L\left[\frac{s}{(s+2)^2}\right]$

SECTION – B (5X5=25)

ANSWER ALL THE QUESTIONS:

11. (a) Solve $(xp - y)^2 = a(1 + p^2)\phi(x^2 + y^2)$

(OR)

(b) Solve $(y^2 e^x + 2xy)dx - x^2 dy = 0$

12. (a) Solve $(D^2 + 16)y = e^{-3x} + \cos 4x$

(OR)

(b) Solve $x^2 \frac{d^2 y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x$

13.(a) Eliminate the F arbitrary function from $f(x^2 + y^2, z - xy) = 0$ and find the partial differential equation

(OR)

(b) Solve $q = xp + p^2$

14. (a) Solve $(D^2 - 2DD' + 2D'^2)z = \sin(x - y)$

(OR)

(b) Find $(D^2 - 4D'^2)z = \cos 4x \cos 3y$

15. (a) Find $L^{-1}\left(\frac{s}{(s^2 a^2 + b^2)}\right)$

(OR)

(b) Fid $L^{-1}\left(\frac{1}{(s+1)(s^2 + 2s + 2)}\right)$

SECTION – C

(3X10=30)

ANSWER ANY THREE QUESTIONS:

16) Solve (i) $(px - y)(py + x) = 2p$ (ii) $xp(3y^2 - ax) = y(2y^2 - ax)$

17) Solve by method of variation of parameters $\frac{d^2y}{dx^2} + n^2 y = \sec nx$

18) Solve $px(y^2 + z) - qy(x^2 + z) = z(x^2 - y^2)$

19) Solve $(D^2 - 3DD' + 2D'^2)z = e^x \cosh y + xy$

20)Solve $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} - 3y = \sin t$,.given that $y = \frac{dy}{dt} = 0$ when t=0

*****ALL THE BEST*****

BBA DEGREE EXAMINATION APRIL 2017

MATHEMATICS AND STATISTICS

FOR MANAGERS-16CCBB4

SECTION – A (10X2=20)

ANSWER ALL THE QUESTIONS.

1. What is Differentiation?
2. What is maximum value?
3. Define Matrix
4. What is the form of square matrix?
5. What is meant by statistics?
6. State any two limitations of the graphs.
7. What is meant standard deviation?
8. What is meant by Range?
9. What are the types of Correlation?
10. What are the assumption s of Karl Pearson's co-efficient of correlation?

SECTION – B (5X5=25)

ANSWER THE FOLLOWING QUESTIONS.

11 (a).Explain the rules of diifferentiation

Or

(b) Discuss the application of the differentiation in business

12.(a) Addition of matrices A= $\begin{pmatrix} 1 & 0 & 2 \\ 3 & 0 & 5 \end{pmatrix}$ B= $\begin{pmatrix} 6 & 9 & 10 \\ 5 & 3 & 2 \end{pmatrix}$

Or

(b) Multiple A= $\begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix}$ B= $\begin{pmatrix} 10 & 8 \\ 5 & 4 \end{pmatrix}$

13.(a).Draw the graph and frequency curve for following details

Daily Wage	50-150	151-200	201-250	251-300	301-351
No of workers	6	10	14	5	10

Or

(b)Draw the angular pie diagram for the following details:

Head of expenditure	Food	clothing	Rent	Education	Medical	Others
Expenditure to rupees	105	65	50	35	20	25

14.(a).Calculate mean and median from following data:

Marks	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
No of students	14	28	33	30	20	15	13	7

(OR)

(b).calculate the standard deviation:

Weight	5-10	10-15	15-20	20-25	25-30	30-35
No of students	2	9	29	54	11	6

15.(a) Calculate the correlation co-efficient from following data:

X	10	6	9	10	12	13	11	9
Y	9	4	6	9	11	13	8	4

Or

(b).Find out the rank correlation coefficient from following data:

Marks in maths	95	55	63	42	72	88	65	49	54	50
Marks in Statistics	63	55	47	60	48	42	69	70	51	45

SECTION – C (3X10=30)

ANSWER ANY THREE QUESTIONS.

16.The demand function for a particular commodity is $y=26-2x-4x^2$ the average cost of production and marketing the commodity is y=x+8.Determine the maximum profit attainable.

17. Find out AB and AC

$$A=\begin{pmatrix} -1 & 2 & 6 \\ 3 & -2 & 4 \\ 2 & 5 & -3 \end{pmatrix} \quad B=\begin{pmatrix} 0 & 1 & 2 & -5 \\ 2 & 4 & -3 & 2 \\ 1 & 5 & 5 & -7 \end{pmatrix} \quad C=\begin{pmatrix} 0 & 5 \\ -1 & -3 \\ -2 & 4 \end{pmatrix}$$

18.Explain the functions and importance of Statistics.

19. Calculate the coefficient of variation for the following data:

Mid value (x)	38	44	50	56	62	68	74	80	86
Frequency(y)	27	72	135	170	285	175	96	28	12

20.Calculate the Karl Pearson Coefficient of Correlatios from the following data:

X	93	96	89	85	83	91	86	82	80
y	100	95	115	127	133	117	130	140	146

B.Sc DEEGREE EXAMINATION,APRIL2017

NUMERICAL ANALYSICS & STATISTICS

SUB.CODE:16SACMA2 **MAX MARKS: 75**

CLASS:I B.Sc (C.S,BCA,&I.T) **TIME: 3HRS**

PART-A (10 $\times$ 2=20)

Answer All questions:

1. Write the aim of Newton – Raphson method
2. State the Newtons Backword interpolation formula
3. Write the Trapezoidal rule
4. State the Simpson's3/8 rule
5. Define Taylor series
6. What is the aim of Euler's method?
7. Define standared Deviation
8. Write the relationship between mean, meadian and mode
9. State any two properties of correlation
co-efficient
10. What is Regression?

PART-B (5 $\times$ 5=25)

Answer All questions:

11.(a) Find a positive root of $x^4 - x^3 - 2x^2 - 6x - 4 = 0$ by using Bisection method

(OR)

(b) Define E and Δ and show that $E = 1 + \Delta$

12.(a) Evaluate $I = \int_0^6 \frac{1}{1+x}$ using Simpson's 1/3rd rule

(OR)

(b) Solve the system of equations by Gauss-Elimination method x+2y+z=3, 2x+3y+3z=10 &

3x-y+2z=13

13. (a)Using Taylor's series method find the value of y(0.1) for $\frac{dy}{dx} = x^2 + y^2$ and y(0)=1

(OR)

(b) Compute y at x=0.25 by Euler method for y'=2xy, y(0)=1

14. (a) Calculate arithmetic mean from the following data

x	75	100	120	150	200
f	5	12	20	14	9

(OR)

(b) Find Quartile deviation from the following data

x	100	200	400	500	600
f	5	8	21	12	6

15.(a) Explain Scatter diagram

(OR)

(b) From the following data find two regression equations

	x	y
Mean	36	85
S.D	11	8

r=0.66

PART-C (3$\times$10=30)

Answer any three questions:

16.Find the positive root of $f(x) = 2x^3 - 3x - 6 = 0$ by Newton –Raphson method correct to five decimal places.

17 Solve by Gauss-Seidal method the following system?

$28x + 4y - z = 32$, $x + 3y + 10z = 24$ and $2x + 17y + 4z = 35$

18. Using Runge-kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ given y(0)=1 at x=0.2

19. Find median and mode from the following data

x	0-10	10-20	20-30	30-40	40-50	50-60	60-70
f	18	41	90	131	140	54	15

20.Calculate Correlation Co-efficient between X and Y

X	64	65	66	67	68	69	70
Y	66	67	65	68	70	68	72

S.NO.5683 T 16SACMA3

(For Candidates admitted from 2016-2017onwards)
B.Sc. DEGREE EXAMINATION,APRIL 2017
PART III-ALLIED
MATHEMATICS-III-OPERATIONS RESEARCH
(For Comp.Sci.,IT ,B.C.A and S.D)

PART- A (2X10=20)

ANSWER ALL THE QUESTIONS

1) Give any two features of OR.
2) Define:Objective Function
3) Write down the matrix form of LPP.
4) State any two applications of LPP.
5) Write down the methods to find an intial basic feasible solution in transportation problem.
6) What do you mean by balanced TP?
7) Write down any two assumptions in sequencing problem.
8) Define Total elapsed time.
9) Define PERT.
10) Write down the rules in constructing network.(Any Two)

PART -B (5X5=25)

ANSWER THE FOLLOWING QUESTIONS.

11.a) The following table shows the machine hours required and machne hours available for manufacturing two products p_1 and p_2.

Product	No.of Units produced	Machine-hour required per unit		Cost per piece
		M1	M2	
p_1	Any number	3	2	30
p_2	Only 10	4	1	50
Available machine hours		36	16	

Formulate the above problem as LPP to minimize the cost.

(OR)

b) Rewrite in Standard form the following LPPs.

i)Maximize : $z = -3x_1 + 2x_2 + 3x_3$

Subject to the constraints:
$$2x_1 - 3x_2 \le 3;$$
$$x_1 + 2x_2 + 3x_3 \ge 5;$$
$$3x_1 + 2x_3 \le 2,$$
$$x_1 \ge 0, x_2 \ge 0 and x_3 \ge 0.$$

i i)Minimize : $z = -3x_1 + x_2 + x_3$

Subject to the constraints:
$$x_1 - 2x_2 + x_3 \le 11;$$
$$-4x_1 + x_2 + 2x_3 \ge 3$$
$$;2x_1 - x_3 = 1,$$
$$x_1, x_2 \ge 0, x_3 \ge 0.$$

12. a) Use Simplex method to Minimize : $z = x_1 - 3x_2 + 2x_3$

Subject to the constraints:
$$3x_1 - x_2 + 2x_3 \le 7;$$
$$-2x_1 + 4x_2 \le 12;$$
$$-4x_1 + 3x_2 + 8x_3 \le 10,$$
$$x_1, x_2, x_3 \ge 0.$$

(OR)

b) Show the following LPP has an Unbounded solution.

Maximize : $z = 4x_1 + x_2 + 3x_3 + 5x_4$

Subject to the constraints:

$$-4x_1 + 6x_2 + 5x_3 - 4x_4 \le 20; 3x_1 - 2x_2 + 4x_3 + x_4 \le 10; 8x_1 - 3x_2 + 3x_3 + 2x_4 \le 20, x_1, x_2, x_3, x_4 \ge 0.$$

13. a) Obtain an initial basic feasible solution to the following transportation problem using the Vogel's approximation method.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	19	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

(OR)

b) Solve the following AP.

	A	B	C	D	E
A	∞	2	5	7	1
B	6	∞	2	8	2
C	8	7	∞	4	7
D	12	4	6	∞	5
E	1	3	2	8	∞

14.a)Find the optimum sequence and the toatal elapsed time for the following sequencing problem.

JOB:	J_1	J_2	J_3	J_4	J_5	J_6
Machine A:	1	3	8	5	6	3
Machine B:	5	6	3	2	2	10

(OR)

b) Solve the Following sequencing problem to minimize total elapsed time.

	A	B	C	D	E	F
M I	3	12	18	9	15	6
M II	9	18	24	24	3	15

15. a) Write down PERT algorithm.

(OR)

b) Draw a network for the following projects.

(i)F<J, B<C,D, D,<G, C<E,F, E<F, G<H, H<J, J<K. A is the starting event.

(ii) A is the first stop

A<B, A<C, C<P, C<E, D<B, B<E, F<D, E<F.

PART - C (3X10=30)

ANSWER ANY THREE QUESTIONS.

16) Use Graphical method to solve the following LPP.

Maximize $z = 4x_1 + 10x_2$

Subject to the constraints

$2x_1 + x_2 \leq 50;$

$2x_1 + 3x_2 \leq 100;$

$2x_1 + 3x_2 \leq 90;$

$x_1, x_2 \geq 0$.

17) Use Two-Phase simplex method to solve:

Maximize : $z = 5x_1 - 4x_2 + 3x_3$

Subject to the constraints:

$2x_1 + x_2 - 6x_3 = 10$;

$6x_1 + 5x_2 + 10x_3 \leq 76$;

$8x_1 - 3x_2 + 6x_3 \leq 50$;

$x_1, x_2, x_3 \geq 0$.

18. Solve the Following assignment problem:

	V	W	X	Y	Z
A	3	5	10	15	8
B	4	7	15	18	8
C	8	12	20	20	12
D	5	5	8	10	6
E	10	10	15	25	10

19. Use graphical method to obtain the total minimum elapsed time to complete both the jobs J_1 and J_2 using machines A,B,C,D,E from the following table.

Job 1	Sequence	A	B	C	D	E
	Time(hours)	6	8	4	12	4
Job2	Sequence	B	C	A	D	E
	Time(hours)	10	8	6	4	12

20. Describe Waiting time in the queue.A small project consist of seven activites for which the relevant dat are given below:

Activity	A	B	C	D	E	F	G
Preceeding activites:	-	-	-	A,B	A,B	C,D,E	C,D,E
Activity duration(days)	4	7	6	5	7	6	5

(For candidates admitted from 2016 – 2017 onwards)

B.Sc. DEGREE EXAMINATION, APRIL 2017

Part III - Allied

ALGEBRA & CALCULUS

(For CS / I.T. / B.C.A. / S.D.)

Time: Three hours **Maximum:75 marks**

PART-A

Answer ALL Questions **(10×2=20)**

1. If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r = 0$, find the value of $\sum \alpha^2 \beta$.
2. Diminish the roots of the equation $x^4 - 5x^3 - 7x^2 - 4x + 5 = 0$ by 2 and find the transformed equation.
3. Define rank of a matrix.
4. Define Eigen value of a matrix.
5. Find the maxima of the function $2x^3 - 3x^2 - 36x + 10$.
6. Find $\frac{du}{dx}$ when $u = x^2 + y^2$ where $y = \frac{1-x}{x}$.
7. Evaluate $\int \frac{dx}{4+5\cos x}$.
8. Evaluate $\int x e^x dx$.
9. Solve $(D^3 - 3D^2 + 4)y = 0$.
10. Find the particular integral of $(D^2 - 8D + 1)y = 8 \sin 5x$.

PART-B

Answer ALL Questions **(5×5=25)**

11. a) If α, β, γ are the roots of $x^3 + px^2 + qx + r = 0$ form the equation whose roots are $\beta+\gamma-2\alpha$, $\gamma+\alpha-2\beta$, $\alpha+\beta-2\gamma$.

(or)

b) Discuss the reality of the roots $x^4 + 4x^3 - 2x^2 - 12x + a = 0$ for all real values of a.

12. a) Find the rank of the matrix $\begin{pmatrix} 1 & 2 & -1 & 3 \\ 2 & 4 & -4 & 7 \\ -1 & -2 & -1 & 2 \end{pmatrix}$ using elementary transformations.

(or)

b) If A = $\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$, calculate A^4 by using Cayley-Hamilton Theorem.

13. a) Show that the least value of $a^2 \sec^2 x + b^2 \operatorname{cosec}^2 x$ is $(a+b)^2$.

(or)

b) If u = $\tan^{-1} \frac{x^3 - y^3}{x - y}$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$.

14. a) Evaluate I = $\int_0^{\frac{\pi}{2}} \log \sin x \, dx$.

(or)

b) Find a sine series for f(x) = k in $0 < x < \pi$.

15. a) Solve: $\sqrt{1-x^2} \sin^{-1} x\, dy + y\, dy = 0$.

(or)

b) Solve $(D^3 - D^2 - D + 4)\, y = 1 + x^2$.

PART-C

Answer Any THREE **(3×10=30)**

16. If the sum of two roots of the equation $x^4 + px^3 + qx^2 + sx + t = 0$ equals the sum of the other two, prove that $p^3 + 8r = 4pq$.
17. Find the characteristic values and characteristic vector of the matrix $\begin{pmatrix} 1 & -1 & 0 \\ 1 & 2 & 1 \\ -1 & 2 & 1 \end{pmatrix}$.
18. Find the points of inflexion of $y = \frac{a^2 x}{x^2 + a^2}$.
19. Find the Fourier cosine series for the function $f(x) = \pi - x$ in $(0, \pi)$.
20. Solve: $(D^3 - 2D + 4)\, y = e^x \cos x$.

S. No 4861T **16SACMA1**

(For Candidates admitted from 2016-2017 onwards)

B.Sc DEGREE EXAMINATIONS NOVEMBER 2016

Part III -Allied

ALGEBRA AND CALCULUS

(For Computer Science, Computer Applications, IT)

Time: Three hours **Maximum:75 marks**

SECTION A - (10×2=20)

Answer ALL questions

1. Diminish the roots of the equation $3x^4 + 7x^3 - 15x^2 + x - 2 = 0$ by -7 and find the transformed equation.
2. State Rolle's theorem.
3. Define singular matrix.
4. State Cayley – Hamilton theorem .
5. Define point of inflexion.
6. Find $\frac{du}{dx}$ when $u = x^2 + y^2$ where $y = \frac{1-x}{x}$.
7. Evaluate $\int tan^{-1}xdx$.
8. Define fourier series f(x) in $(-\pi, \pi)$.
9. Solve $ydx - xdy + 3x^2y^2e^{x^3} = 0$.
10. Solve $(D^2 - 5D + 4)y = 0$.

SECTION B - (5×5=25)

ANSWER ALL QUESTIONS

11. (a) If α, β, γ are the roots of the equation

$x^3 + ax^2 + bx + c = 0$, form the equation whose roots are $\alpha\beta, \beta\gamma, \gamma\alpha$

(OR)

(b) Find the nature of the roots of the equation

$$x^4 + 15x^2 + 7x - 11 = 0$$

12. (a) Find the inverse of $\begin{pmatrix} 1 & 2 & -1 \\ 3 & 8 & 2 \\ 4 & 9 & -1 \end{pmatrix}$

(OR)

(b) Find the rank of the matrix $\begin{pmatrix} 1 & -1 & 2 \\ 2 & 6 & 3 \\ 3 & 13 & 4 \end{pmatrix}$

12. (a) Find the maxima and minima of the function

$2x^3 - 3x^2 - 36x + 10$

(OR)

(b) If $u = tan^{-1}\frac{x^3+y^3}{x-y}$,prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$

14. (a) Evaluate $\int_0^{\frac{\pi}{2}} \frac{(\sin)^{3/2}}{(\sin)^{3/2} + (\cos)^{3/2}} dx$

(OR)

(b) Evaluate $\int \frac{x+sinx}{1+cosx} dx$.

15. (a) Solve $(D^2 - 4D + 3)y = sin3xcos2x$.

(OR)

(b) Solve $x\frac{dy}{dx} + ylogx = e^x x^{1-\frac{1}{2}logx}$.

SECTION C-(3X10=30)

ANSWER ANY THREE QUESTIONS

16. Find the condition that the roots of the equation $ax^3 + 3bx^2 + 3cx + d = 0$ may be in geometric progression. Solve the equation $27x^3 + 42x^2 - 28x - 8 = 0$.

17. Find the characteristic values and characteristic vectors of

$$\begin{pmatrix} 2 & 0 & -1 \\ 0 & 2 & -2 \\ 1 & -1 & 2 \end{pmatrix}.$$

18. If $x.y > 0$ & $x^2 + xy + y^2 = 3k^2$, prove that the greatest value of $ax + by$ is $2k\sqrt{a^2 - ab + b^2}$.

19. Find the Fourier series for the function $f(x) = e^x$ in $(0,2\pi)$.

20. Solve $(D^2 + 16)y = e^{-3x} + cos4x$.

16 SACMM 1 **S.No.5621 T**

(For candidates admitted from 2016-2017 onwards)

B.Sc. DEGREE EXAMITION, APRIL 2017.

Part III-Allied

MATHEMATICS-I-CALCULUS AND FOURIER SERIES

Time: Three hours **Maximum : 75 marks**

PART A-(10x2=20)

Answer ALL questions

1. If $y=(ax+b^m)$ then find $\frac{d^2y}{dx^2}$.
2. State the Leibnitz theorem.
3. Evaluate $\int \frac{dx}{\sqrt{x}+\sqrt{1+x}}$
4. Evaluate $\int \frac{dx}{4x^2-4x+2}$.
5. Show that $\int_0^{\pi/2} \sin^n x dx = \int_0^{\pi/2} \cos^n x dx$.
6. Evaluate $\int_0^{\pi/2} \sin^6 x \cos^5 x dx$.
7. Evaluate $\int_0^3 \int_0^2 xy(x+y) dy dx$
8. Evaluate $\int_0^1 \int_0^x \int_0^y xyz dz dy dx$
9. Define Fourier series.
10. Find the Fourier coefficient a_0 for $f(x)=x$ in $(-\pi,\pi)$.

PART B-(5 x5=25)
Answer ALL questions

11.(a) If $xy = ae^{x} + be^{-x}$ then prove that $x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - xy = 0$.

(Or)

b)What is the radius of curvature of the curve $x^2 + y^2 = 2$ at the point (1,1)?

12 .a) Evaluate $\int \frac{2x+3}{x^2+x+1} dx$

(OR)

b)Show that $\int \sqrt{x^2} - a^2\, dx = \frac{x\sqrt{x^2-a^2}}{2} - \frac{a^2}{2} cosh^{-1}\left(\frac{x}{a}\right)$

13.a) Show that $\int_0^{\frac{\pi}{2}} log(1 + tan\theta)\, d\theta = \frac{\pi}{8}\log 2$

(OR)

b) Evaluate $\int_0^{\frac{\pi}{2}} x\left((1 - x^2)^{\frac{1}{2}}\right) dx$

14). a) Evaluate $\iint xydxdy$ taken over the first quadrant of the circle $x^2 + y^2 = a^2$

(OR)

b) Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \int_0^{\sqrt{a^2-x^2-y^2}} xyz\, dzdydx$

15).a) Find the Fourier series for f(x)=e^x in the interval $(0,2\pi)$.

(OR)

b) Find the Fourier series for f(x) = k in 0$< x < \pi$.

PART C-(3x10=30)

Answer any THREE question

16) a) If $u = x^2 + y^2 + z^2$,where $x = e^t, y = e^t sint \; and \; z = e^t cost$,then

prove that $\frac{du}{dt} = 4e^{2t}$

b) Short notes on Jacobian of two variables.

17. (a)Evaluate $\int \frac{3x+1}{(x-1)^2(x+3)} dx$.

(b) Evaluate $\int \frac{6x+5}{\sqrt{6x+x-2x^2}} dx$.

18.Find the reduction formula for $\int \cos^n x dx$ .Also prove that

$$\int_0^{\pi/2} \cos^n x dx = \begin{cases} \frac{n-1}{n}.\frac{n-3}{n-2}....\frac{1}{2}\frac{\pi}{2} & if \; n \; is \; even \\ \frac{n-1}{n}.\frac{n-3}{n-2}....\frac{2}{3} & if \; n \; is \; even \end{cases}$$

19. Evaluate $\int_0^a \int_{x^2/a}^{2a-x} xydxdy$ by changing the order of integration .

20.Find the Fourier series for the function $f(x) = \begin{cases} \pi + 2x & if \; -\pi < x < 0 \\ \pi - 2x & if \; 0 \le x \le \pi \end{cases}$

Also deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ... = \frac{\pi^2}{8}$.

S.NO.4571T **16SACMM1**

B.SC ,DEGREE EXAMINATION – NOVEMBER 2016

PART-III(16SACMM1)

CALCULUS AND FOURIER SERIES

PART-A(10*2=20)

ANSWER ALL QUESTIONS

1. Y=cos(ax+b) then find $\frac{d^2y}{dx^2}$
2. Define the radious of curvature.
3. Evaluate $\int \frac{dx}{9x^2 - 4}$
4. Evaluate $\int \frac{x}{1+x}dx$
5. Evaluate $\int x^2 e^x dx$
6. Find the value of $\int_0^{\frac{\pi}{2}} \sin^7 x dx$
7. E valuate: $\iint x^2 + y^2 dxdy$
8. Show that $\iiint_0 xyzdzdydx = \frac{a^6}{48}$

9.Define an odd function

10.Find the fourier coefficient a_0 for $f(x)=e^x$ in $(0,2\pi)$

PART– B (5 x 5 = 25)

11.a)If $y = \sin(m\sin^{-1} x)$ then prove that $(1-x^2)y_2 - xy_1 + m^2 y = 0$ (or)

b)Show that the radius of curvature at any point of the catenary $y = c\cosh\frac{x}{c}$ is $\frac{y^2}{c}$

12(a) E valuate : $\int \frac{\tan x}{\sec x + \cos x}$

(or)

b.S.T $\sqrt{\int \frac{6x+5}{\sqrt{6+x-2x^2}} dx} = 3\sqrt{6+x-2x^2} + \frac{13}{2\sqrt{2}} \sin^{-1}(\frac{4x-1}{7})$

13)a. If f(x) is an even function then prove that $\int_{-a}^{a} f(x) = 2\int_{0}^{a} f(x)dx$

(or)

b) Find the reduction formula for $\int \sin^n x dx$.

14)a) Evaluate $\iint ydxdy$ over the region between the parabola x^2=y and the line x+y=2.

(or)

b)Evaluate $\iiint \frac{dzdydx}{(x+y+z+1)}$

15) If $f(x) = \begin{cases} -x, if\ -\pi \leq\ x < 0 \\ x, if\ 0 \leq\ x \geq 0 \end{cases}$ expand f(x) as a fourier series in the interval(-π,π)

(or)

b) Find the Fourier sine series for the function f(x)=π-x in (0,π)

PART-C

Answer any three questions.

16)a)If u=iog(x+y+z) where x=cost ,y=$\sin^2$ t,and z=$\cos^2$ t, find $\frac{du}{dt}$.

b)Narrate the Jacobian of three variables.

17)a) Evaluate : $\int \frac{dx}{x(x^3+1)}$

b)Show a122t : $\int \frac{dx}{4+5\cos x} = \frac{1}{3}\log\left(\frac{\tan x/2+3}{3-\tan x/2}\right)$

18)If $I_n = \int_0^{\frac{\pi}{2}} x^n \cos x dx$ then prove that $I_n + n(n-1)_{In-2} = \left(\frac{\pi}{2}\right)$.Also evaluate $\int_0^{\frac{\pi}{4}} \cos^2 x dx$.

19)Evaluate $\iint \frac{e^{-y}}{y} dxdy$ by changing the order of integration.

20) Find the fourier series for the function $f(x)=x^2$ where $-\pi \leq x \leq \pi$ and deduce that a $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+.........=\frac{\pi}{6}$

S.No.5622 T **16SACMM2**

(For candidates admitted from 2016-2017 onwards)

B.Sc DEGREE EXAMINATION, APRIL 2017

Part III- Allied

Algebra Analytical Geometry(3d) & Trigonometry

MAX MARKS: 75 **TIME: 3HRS**

SECTION – A **(10X2=20)**

ANSWER ALL THE QUESTIONS.

1. Write down the two middle terms in the expansion of $(x-2y)^{13}$
2. If $\left(y = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots.\right)$ then show that $\left(x = y + \frac{y^2}{2!} + \frac{y^3}{3!} + \frac{y^4}{4!} + \ldots.\right)$
3. Define Skew-symmetric matrix
4. Show that $\begin{bmatrix} 1 & 1+i & -2+i \\ 1-i & 2 & 8+i \\ -2+i & 8-i & 0 \end{bmatrix}$ is a Hermitian matrix
5. Find the equation of the sphere with centre $\left(\frac{-1}{3}, \frac{2}{3}, \frac{1}{3}\right)$ and radius 1
6. Find the equation of the sphere which passes through the circle $x^2 + y^2 + z^2 = 9, 2x + 3y + 4z = 5$ and the point(1,2,3)
7. If $\sin^5\theta = (A\cos\theta + B\cos 3\theta + C\cos 5\theta)$,P.T $\sin^5\theta = (A\sin\theta - B\sin\theta + C\sin 5\theta)$
8. P.T $\cosh^2 x - \sinh^2 x = 1$
9. If $\tan\frac{x}{2} = \tanh\frac{y}{2}$ *provethat* $\cos x \cosh y = 1$
10. If $\cos(A + iB) = \cos\theta + i\sin\theta$ *provethat* $\cos 2A + \cosh 2B = 2$

SECTION – B (5X5=25)

ANSWER THE FOLLOWING QUESTIONS.

11. (a) Sum of the series $1+\frac{1+2}{2!}+\frac{1+2+3}{3!}+\frac{1+2+3+4}{4!}+......to\infty$ **(OR)**

(b) Show that $\log_3 e-\log_9 e-\log_{17} e-\log_{81} e+....=\log_3 2$

12.(a) Verify cayley hamilton theroem if A= $\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$ **(OR)**

(b) Show that $\begin{bmatrix} 2/3 & 2/3 & 1/3 \\ -2/3 & 1/3 & 2/3 \\ 1/3 & -2/3 & 2/3 \end{bmatrix}$ is orthogonal

13.(a) Prove that the line $\frac{x+1}{-3}=\frac{y+10}{8}=\frac{z-1}{2};\frac{x+3}{-4}=\frac{y+1}{7}=z-4$

Are coplanar.Find their point of intersection and the plane through them.

(OR)

(b) . Find the equation of the sphere which touches the sphere $x^2+y^2+z^2-6x+2z+1=0$ at the point(2,-2,1) and passes through the orgin.

14) a)Show that $\sin 5\theta = 5\sin\theta - 20\sin^3\theta + 16\sin^5\theta$

(OR)

(b) Show that $\cos^4\theta\sin^2\theta=\frac{1}{32}-(\cos 6\theta-2\cos 4\theta+\cos 2\theta+2)$

15. (a) Prove that $\cosh^{-1} y = \pm\log(y + \sqrt{y^2 - 1})$

(OR)

(b) If $\tan\frac{x}{2} = \tanh\frac{y}{2}$ P.T sinhy=tanx & $y = \log\tan(\frac{\pi}{4} + \frac{x}{2})$

SECTION – C (3X10=30)

ANSWER ANY THREE QUESTIONS.

16. a)Sum of the series

$1 + n\left(\frac{2n}{1+n}\right) + \frac{n(n+1)}{2!}\left(\frac{2n}{1+n}\right)^2 + \frac{n(n+1)(n+2)}{3!}\left(\frac{2n}{1+n}\right)^3 + ...to\infty$ b)Find the Sum to infinity of $\frac{7}{72} + \frac{7.28}{72.96} + \frac{7.28.49}{72.96.120} + ...$

17. Find the Eigen values & Eigen vectors of matrix $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ 7 & 2 & -3 \end{bmatrix}$

18. Find the equation of the sphere which passes through the circle 6 $x^2 + y^2 + z^2 - 2x - 2y = 0, x + 2y + 3z = 8$ and touches the plane 4x+3y=25

19. If $u = \log\tan\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$ S.T (i) $\tanh\frac{u}{2} = \tan\frac{\theta}{2}$ &(ii) $\theta = -i\log\tan\left(\frac{\pi}{4} + i\frac{u}{2}\right)$

20. a)Prove that $\sinh^{-1} x = \log(x + \sqrt{x^2 + 1})$

b)Seperate Real & Imaginary parts of $\coth(\alpha + i\beta)$

*****ALL THE BEST*****

S.NO.5623 T **16 SACMM 3**

(For candidates admitted from 2016- 2017 onwards)

B.Sc. DEGREE EXAMINATION , APRIL 2017.

Part III – ALLIED

ODE,PDE, LAPLACE TRANSFORMS AND VECTOR ANALYSIS

(For Physics, Chemistry,Geology,IND,Electronics)

Time : Three hours **Maximum : 75 marks**

SECTION A – (10 X 2 = 20)

Answer All questions.

1. Solve : $x^2p^2+3xy\, p+2y^2 = 0$
2. Solve : $y = (x-a)\, p-p^2$
3. Eliminate a and b from $\frac{x^2+y^2}{a^2} + \frac{z^2}{b^2} = 1$
4. Define : Singular integral.
5. Write down the formula for L (f^{i} (t)).
6. Find $L^{-1}(t^2e^{-3t})$
7. Find $L^{-1}\left(\frac{s}{s^2+k^2}\right)$
8. Find $L^{-1}\left(\frac{1}{s(s+a)}\right)$
9. Find grad $\emptyset$ for $\emptyset(x, y, z) = x^2 + y - z$ at (1,1,1)
10. Prove that $\nabla r^2 = 2\vec{r}$ where $r^2 = \vec{r} \cdot \vec{r}$

SECTION B – (5 X 5 = 25)

Answer All questions.

11. (a) Solve : $(D^2-2mD+m^2)y = e^{mx}$.

Or

(b) Solve : $(D^3-D^2-D+1)y = (1+x^2)$.

12. (a) Find the integral surface of $x^2p+y^2q+z^2 = 0$ which through the hyperbola $xy = x+y; z=1$.

Or

(b) Prove that the characteristics of $q = 3p^2$ that pass through the point (-1,0,0) generate the cone $(x+1)^2+12yz=0$.

13. (a) Find $L(\frac{\sin at}{t})$

Or

(b) Find the Laplace transform of (sinat – at cosat).

14. (a) Find $L^{-1}(\frac{s+2}{(s^2+4s+5)^2})$

Or

(b) Find $L^{-1}(\frac{1}{(s^2+a^2)2})$.

15.(a) If $\nabla\emptyset = (y + sinz)i + xj + xcosz\, k$ find $\emptyset$

Or

(b) Find the angle between the surfaces $x^2 + y^2 + z^2 = 29$ and $x^2 + y^2 + z^2 + 4x - 6y - 8z - 47 = 0$ at (4,-3,2).

SECTION- C(3 x 10 = 30)

Answer any Three questions.

16. Show that the solution of the differential equation

$\frac{d^2y}{dt^2} + 4y = Asinpt$ which is such that y=0 and $\frac{dy}{dt} = 0$ when t=0 is

$$y = \begin{cases} \frac{A(sinpt - \frac{1}{2}psin2t)}{4-p^2} & if\ p \neq 2 \\ \frac{A(sin2t - 2tcos2t)}{8} & if\ \ p = 2 \end{cases}$$

17. Solve $px(y^2 + z) - qy(x^2 + z) = z(x^2 - y^2)$. Find the surface that contains the straight line $x + y = 0, z = 1$..

18. Evaluate the following integrals :

(a) $\int_0^\infty te^{-3t}\, sintdt$

(b) $\int_0^\infty \frac{cos6t - cos4t}{t} dt$

19. Solve the equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = sint$ given that

$y = \frac{dy}{dt} = \ \ 0$ when t=0.

20. Prove that :

    (a) curl(r x a)= -2a.

    (b) div(r x a)=0 where a is a constant vector.

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