INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

FRESHMAN ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	**Mathematics-II**
Course Code	:	**A30006**
Class	:	II B. Tech I Semester
Branch	:	CIVIL
Year	:	2016 – 2017
Course Coordinator	:	Ms.K.Rama Jyothi, Assistant Professor, Freshman Department
Course Faculty	:	Ms.K.Rama Jyothi, Assistant Professor, Freshman Department

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

1. Group - A (Short Answer Questions)

S. No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT-I VECTOR CALCULUS		
1	Define gradient?	Remember	1
2	Define divergence?	Remember	1
3	Define curl?	Remember	1
4	Define laplacian operator?	Remember	1
5	Find $\Delta(x^2yz)$	Apply	1
6	Evaluate the angle between the normal to the surface xy= z^2 at the points (4,1,2) and (3,3,-3)?	Understand	1
7	Find a unit normal vector to the given surface $x^2y+2xz=4$ at the point (2,-2,3)?	Apply	1
8	If $\bar{a}$ is a vector then prove that grad $(\bar{a},\bar{r}) = \bar{a}$?	Understand	1
9	Define irrotational and solenoidal vectors?	Remember	1
10	Prove that $(\nabla f \times \nabla g)$ is solenoidal?	Analyze	1
11	Prove that F=yzi+zxj+xyk is irrotational?	Analyze	1
12	Show that (x+3y)i+(y-2z)j+(x-2z)k is solenoidal?	Understand	1
13	Show that curl($r^n\bar{r}$)=0?	Understand	1
14	Prove that $curl(\emptyset\bar{a}) = (grad\emptyset) \times \bar{a} + \emptyset curl\bar{a}$?	Analyze	1

S. No	Question	Blooms Taxonomy Level	Course Outcome
15	Prove that div curl$\bar{f}$=0?	Analyze	1
16	Define line integral?	Remember	2
17	Define surface integral?	Remember	2
18	Define volume integral?	Remember	2
19	State Green's theorem?	Understand	3
20	State Gauss divergence theorem?	Understand	3
	UNIT-II **FOURIER SERIES AND FOURIER TRANSFORMS**		
1	Define periodic function and write examples	Remember	5
2	Define even and odd function	Remember	5
3	Express the function f(x) as the sum of an even function and an odd function	Understand	5
4	Find the functions are even or odd (i) x sinx+cosx+x^2coshx (ii)xcoshx+x^3sinhx	Apply	5
5	If f and g are periodic functions with same period T show that (af+bg) are also periodic function of period T where a and b are real numbers	Understand	5
6	Define Euler's formulae	Remember	5
7	Write Dirichlet's conditions	Understand	4
8	If f(x)= $x^2 - 2$ in (-2,2) then find b_2	Apply	5
9	If f(x)= x^2 in (-2,2) then a_0	Apply	5
10	If f(x)= $\sin^3 x$ in (-π , π) then find a_n	Apply	5
11	If f(x)= x^4 in (-1,1) then find b_n	Apply	5
12	State Fourier integral theorem	Understand	6
13	Write about Fourier sine and cosine integral	Understand	6
14	Define Fourier transform and finite Fourier transform?	Remember	6
15	Find the Fourier sine transform of xe^{-ax}	Apply	6
16	Find the finite Fourier cosine transform of f(x)=1in 0<x<π	Apply	6
17	Find the finite Fourier sine transform of f(x)=2x in (0, π)	Apply	6
18	Find the inverse finite sine transform f(x) if $F_s(n) = \frac{1-\cos n\pi}{n^2\pi^2}$	Apply	6
19	Write the properties of Fourier transform	Understand	6
20	If finite Fourier sine transform of f is $\frac{2\pi}{n^3}(-1)^{n-1}$ find f(x)	Apply	6
	UNIT-III **INTERPOLATION AND CURVE FITTING**		
1	Define Interpolation and extrapolation	Remember	7
2	Explain forward difference interpolation	Understand	7
3	Explain backward difference interpolation	Understand	7
4	Explain central difference interpolation	Understand	7
5	Define average operator and shift operator	Remember	7
6	Prove that $\Delta = E - 1$	Analyze	9
7	Prove that $\nabla = 1 - E^{-1}$	Analyze	9
8	Prove that $(1+\Delta)(1-\nabla) = 1$	Analyze	8
9	Construct a forward difference table for f(x)=x^3+5x-7 if x=-1,0,1,2,3,4,5	Analyze	9
10	Prove that Δ[x(x+1)(x+2)(x+3)]=4(x+1)(x+2)(x+3)	Analyze	9
11	Evaluate Δ log f(x)	Understand	9
12	Evaluate Δ f(x)g(x)	Understand	9
13	Evaluate Δ cos x	Understand	9

S. No	Question	Blooms Taxonomy Level	Course Outcome
14	Find the missing term in the following table X: 0, 1, 2, 3, 4 Y: 1, 3, 9, ------, 81	Apply	8
15	What is the principle of method of least square	Understand	9
16	Solve the difference equation $y_{n+2}+5y_{n+1}+6y_n=0$	Understand	8
17	Derive the normal equations for straight line	Understand	8
18	Derive the normal equations for second degree parabola	Understand	8
19	Explain errors in interpolation	Understand	9
20	Write the normal equations to fit the curve $y = ae^{bx}$	Understand	8
	UNIT-IV **Numerical Techniques**		
1	Define algebraic and transcendental equation and give example	Remember	10
2	Explain graphically the root of an equation	Understand	10
3	Write about bisection method	Understand	10
4	Write about false position method	Understand	10
5	Write a short note on iterative method	Understand	10
6	Explain iterative method approach in solving the problems	Understand	10
7	State the condition for convergence of the root by iterative method	Understand	10
8	Derive Newton’s Raphson formula	Understand	10
9	Show that Newton’s Raphson method is quadratic convergence	Understand	10
10	Establish the formula to find the square root of a number N by Newton’s Raphson method	Analyze	10
11	Find the square root of a number 16 by using Newton’s Raphson	Apply	10
12	Derive the formula to find the reciprocal of a number	Understand	10
13	Explain solving system of non-homogeneous equations	Understand	10
14	Explain LU decomposition method	Apply	11
15	Define Crout’s and Doolittle’s method	Remember	11
16	If A=LU and $A = \begin{bmatrix} 1 & 5 \\ 2 & 3 \end{bmatrix}$ then find L	Apply	11
17	Explain the procedure to find the inverse of the matrix by using LU decomposition method	Understand	11
18	Write a short note on Jacobi’s method	Understand	11
19	Write a short note on Gauss Seidel iterative method	Understand	11
20	Write the difference between Jacobi’s and Gauss Seidel iterative method	Understand	11
	UNIT-V **Numerical Integration and Numerical solutions of differential equations**		
1	Derive the Newton-cote’s quadrature formula	Understand	12
2	Explain Trapezoidal rule	Understand	12
3	Explain Simpson’s 1/3 and 3/8 rule	Understand	12
4	Estimate $\int_0^{\Pi/2} e^{\sin x} dx$ taking h=∏/6correct o four decimal places	Understand	12
5	Explain two point and three point Gaussian quadrature	Understand	12
6	Compute using Gauss integral $\int_{-1}^{1} \sqrt{1-x^2}\, dx, n=3$	Apply	12
7	Compute using Gauss integral $\int_0^1 x dx, n=3$	Apply	12
8	Define initial value problem	Remember	13
9	Define boundary value problem	Remember	13

S. No	Question	Blooms Taxonomy Level	Course Outcome
10	Explain single step method and step by step method	Understand	13
11	Explain Taylor's series method and limitations	Understand	13
12	Explain Picard's method of successive approximation Write the second approximation for $y^1=x^2+y^2, y(0)=1$	Understand	13
13	Explain Euler's method	Understand	13
14	Explain Euler's modified method	Understand	13
15	Give the difference between Euler's method and Euler's modified method	Analyze	13
16	Find y(0.1) given $y^1=x^2-y, y(0)=1$ by Euler's method	Apply	13
17	Explain Runge-Kutta second and classical fourth order	Understand	13
18	Write any three properties of Eigen value problems	Understand	14
19	Explain power method to find the largest Eigen value of a matrix	Understand	14
20	Write the finite difference formula for $y^1(x)$, $y^{11}(x)$	Understand	14

1. Group - B (Long Answer Questions)

S. No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT-I VECTOR CALCULUS		
1	Find the constants a and b so that the Surface $ax^2 - byz = (a+z)x$ will be orthogonal to the Surface $4x^2y + z^3 = 4$ at the point (-1,1,2).	Apply	1
2	Prove that $\nabla f(r) = \frac{\bar{r}}{r}.f^1(r)$	Analyze	1
3	Prove that if $\bar{r}$ is the position vector of any point in the space then $r^n.\bar{r}$ is irrotational and is solenoidal if $n=-3$.	Analyze	1
4	Prove that $div(r^n.\bar{r}) = (n+3)r^n$. Hence Show that $\frac{\bar{r}}{r^3}$ is solenoidal Vector	Analyze	1
5	If $\bar{F} = (5xy - 6x^2)\bar{i} + (2y - 4x)\bar{j}$ evaluate $\int_C \bar{F}.d\bar{r}$ along the curve C in xy plane $y=x^3$ from (1,1) to (2,8).	Understand	2
6	Evaluate the line integral $\int_c (x^2+xy)dx + (x^2+y^2)dy$ where c is the square formed by the lines $y=\pm1$ *and* $x=\pm1$	Understand	2
7	Evaluate $\iint_S \bar{A}.\bar{n}ds$ where $\bar{A} = Z\bar{i} + x\bar{j} - 3y^2z\bar{k}$ and S is the surface of the cylinder $x^2+y^2=16$ included in the first octant between Z=0 and Z=5	Understand	2
8	If $\bar{F} = (x^2-27)\bar{i} - 6yz\bar{j} + 8xz^2\bar{k}$ evaluate $\int_C \bar{F}.\bar{dr}$ from the point (0,0,0) to the point (1,1,1) along the straight line from (0,0,0) to (1,0,0) then from (1,0,0) to (1,1,0) and then finally from (1,1,0) to (1,1,1)	Understand	2
9	Evaluate $\int_c \bar{f}.d\bar{r}$ where $f = 3xyi - y^2j$ and C is the parabola $y=2x^2$ from (0,0) to (1,2).	Understand	2
10	Evaluate $\iint_S \bar{F}.d\bar{s}$ if $f = yzi + 2y^2j + xz^2k$ and S is the Surface of the Cylinder $x^2+y^2=9$ contained in the first Octant between the planes z=0	Understand	2

S. No	Question	Blooms Taxonomy Level	Course Outcome
	and z=2.		
11	Evaluate $\oint_c (yz\,dx + xz\,dy + xy\,dz)$ over arc of a helix $x = a\cos t,\ y = a\sin t,\ z = kt$ as t varies from 0 to 2π .	Understand	2
12	Find the circulation of $\bar{f}$ around the curve c Where $\bar{f} = (e^x \sin y)i + (e^x \cos y)j$ and c is the rectangle whose vertices are $(0,0),(1,0),(1,\frac{\pi}{2}),(0.\frac{\pi}{2})$	Apply	2
13	Verify gauss divergence theorem for the vector point function F=(x^3-yz)i-2yxj+2zk over the cube bounded by x=y=z=0and x=y=z=a	Apply	3
14	Verify divergence theorem for $2x^2yi - y^2j + 4xz^2k$ taken over the region of first octant of the cylinder $y^2 + z^2 = 9$ and $x = 2$	Apply	3
15	Verify Green's theorem in the plane for $\int_C (x^2 - xy^3)dx + (y^2 - 2xy)dy$ where C is a square with vertices (0,0),(2,0),(2,2),(0,2).	Apply	3
16	Applying Green's theorem evaluate $\int (y - \sin x)dx + \cos x\,dy$ where C is the plane Δ^{le} enclosed by $y = 0,\ y = \frac{2x}{\pi},\ and\ x = \frac{\pi}{2}$	Apply	3
17	Verify Green's Theorem in the plane for $\int_c (x^2 - xy^3)dx + (y^2 - 2xy)dy$ where C is a square with vertices (0,0),(2,0),)(2,2),(0,2)	Apply	3
18	Verify Stokes theorem for $f = (2x - y)i - yz^2j - y^2zk$ where S is the upper half surface $x^2+y^2+z^2=1$ of the sphere and C is its boundary	Apply	3
19	Verify Stokes theorem for $f = (x^2 - y^2)i + 2xyj$ over the box bounded by the planes x=0,x=a,y=0,y=b,z=c	Apply	3
20	Evaluate by Stroke's Theorem $\iint_S Curl\vec{F}.\vec{n}ds$ where $\vec{F} = y^2\vec{i} + x^2\vec{j} - (x+Z)/\overline{C}$ and S comprising the planes x=0,y=0,y=4;z=-1	Apply	3
	UNIT-II **FOURIER SERIES AND FOURIER TRANSFORMS**		
1	Obtain the Fourier series expansion of f(x) given that $f(x) = (\pi - x)^2$ in $0 < x < 2\pi$ and deduce the value of $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + ... = \frac{\pi^2}{6}$.	Understand	5
2	Obtain Fourier cosine series for f(x) = x sin x 0<x< π and show that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \frac{1}{7.9} + ... = \frac{\pi - 2}{4}$.	Understand	5
3	Find the Fourier Series to represent the function $f(x) = \|\sin x\|$ in - π <x< π .	Apply	5
4	Find the Fourier series to represent $f(x) = x^2\ in\ (0,2\pi)$.	Apply	5
5	Express f(x)= x as a Fourier series in $(-\pi,\pi)$.	Understand	5

S. No	Question	Blooms Taxonomy Level	Course Outcome
6	If f(x)=coshax expand f(x) as a Fourier Series in $(-\pi,\pi)$.	Understand	5
7	Expand the function $f(x)=x^2$ as a Fourier series in $(-\pi,\pi)$.	Understand	5
8	If $f(x)=\begin{cases} x \; for\, 0<x<\frac{\pi}{2} \\ \pi - x for \frac{\pi}{2}<x<\pi \end{cases}$. Then prove $f(x)=\frac{4}{\pi}\left[\sin x-\frac{1}{3^2}\sin 3x+\frac{1}{5^2}\sin 5x---\right]$.	Apply	5
9	Find the Fourier series to represent the function f(x) given by: $f(x)=\begin{cases} 0 \; for -\pi\le x\le 0 \\ x^2 \; for\, 0\le x<\pi \end{cases}$	Apply	5
10	Find cosine and sine series for $f(x)=\pi-x$ in $[0,\pi]$.	Apply	5
11	Expand f(x)=cosx for $0<x<\pi$ in half range sine series	Understand	5
12	Using Fourier integral show that $e^{-x}cosx = \frac{2}{\pi}\int_0^\infty \frac{\lambda^2+2}{\lambda^4+4} cos\lambda x dx$	Understand	6
13	Find the Fourier transform of f(x) defined by $f(x)=\begin{cases} 1-x^2 \; if \; \lvert x\rvert\le 1 \\ 0 \quad if \; \lvert x\rvert>1 \end{cases}$	Apply	6
14	Find the Fourier transform of $f(x)=\begin{cases} a^2-x^2 \; if \; \lvert x\rvert<a \\ 0 \quad if \; \lvert x\rvert > a \end{cases}$ Hence show that $\int_0^\infty \frac{\sin x-\cos x}{x^3}dx=\frac{\pi}{4}$	Apply	6
15	Find the Fourier sine transform for the function f(x) given by $f(x)=\begin{cases} \sin x, \; 0<x<a \\ 0 \qquad x\ge a \end{cases}$	Apply	6
16	Find the finite Fourier sine and cosine transforms of f(x) = sinax in (0,π).	Apply	6
17	Find the finite Fourier sine and cosine transforms of f(x) = $\frac{e^{-ax}-e^{-bx}}{x}$	Apply	6
18	Find the inverse Fourier cosine transform f(x) of $F_c(p) = p^n e^{-ap}$ and inverse Fourier sine transform f(x) of $F_s(p) = \frac{p}{1+p^2}$	Apply	6
19	Find the inverse Fourier transform f(x) of $F(p) = e^{-\lvert p\rvert y}$	Apply	6
20	Evaluate using Parseval's identity $\int_0^\infty \frac{x^2}{(a^2+x^2)^2}dx \; (a>0)$	Understand	6

<table>
<tr><th>S. No</th><th>Question</th><th>Blooms Taxonomy Level</th><th>Course Outcome</th></tr>
<tr><td colspan="4">UNIT-III
INTERPOLATION AND CURVE FITTING</td></tr>
<tr><td>1</td><td>Find the interpolation polynomial for the following data using Newton's forward interpolation formula.
<table>
<tr><td>x</td><td>2.4</td><td>3.2</td><td>4.0</td><td>4.8</td><td>5.6</td></tr>
<tr><td>f(x)</td><td>22</td><td>17.8</td><td>14.2</td><td>38.3</td><td>51.7</td></tr>
</table></td><td>Apply</td><td>8</td></tr>
<tr><td>2</td><td>Use Newton's forward difference formula to find the polynomial satisfied by (0,5), (1,12),(2,37) and (3,86).</td><td>Apply</td><td>8</td></tr>
<tr><td>3</td><td>
<table>
<tr><td>x</td><td>20</td><td>25</td><td>30</td><td>35</td><td>40</td><td>45</td></tr>
<tr><td>y</td><td>354</td><td>332</td><td>291</td><td>260</td><td>231</td><td>204</td></tr>
</table>
Find f(22), from the following data using Newton's Backward formula.</td><td>Apply</td><td>8</td></tr>
<tr><td>4</td><td>Given sin 45=0.7071,sin 50=0.7660,sin 55=0.8192 and sin 60=0.8660 find sin 52 using newton's formula</td><td>Apply</td><td>8</td></tr>
<tr><td>5</td><td>The population of a town in the decimal census was given below. Estimate the population for the year 1895
<table>
<tr><td>Year (x)</td><td>1891</td><td>1901</td><td>1911</td><td>1921</td><td>1931</td></tr>
<tr><td>Population (y)</td><td>46</td><td>66</td><td>81</td><td>93</td><td>101</td></tr>
</table></td><td>Understand</td><td>8</td></tr>
<tr><td>6</td><td>Find y(25) given that y(20)=24, y(24)=32, y(28)=35, y(32)=40, using Gauss forward difference formula.</td><td>Apply</td><td>8</td></tr>
<tr><td>7</td><td>Find by Gauss's backward interpolating formula the value of y at x = 1936 using the following table
<table>
<tr><td>X</td><td>1901</td><td>1911</td><td>1921</td><td>1931</td><td>1941</td><td>1951</td></tr>
<tr><td>Y</td><td>12</td><td>15</td><td>20</td><td>27</td><td>39</td><td>52</td></tr>
</table></td><td>Apply</td><td>8</td></tr>
<tr><td>8</td><td>Find by Gauss's backward interpolating formula the value of y at x = 8 using the following table
<table>
<tr><td>X</td><td>0</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td></tr>
<tr><td>y</td><td>7</td><td>11</td><td>14</td><td>18</td><td>24</td><td>32</td></tr>
</table></td><td>Apply</td><td>8</td></tr>
<tr><td>9</td><td>Using Lagrange's formula find y(6) given
<table>
<tr><td>x</td><td>3</td><td>5</td><td>7</td><td>9</td><td>11</td></tr>
<tr><td>y</td><td>6</td><td>24</td><td>58</td><td>108</td><td>74</td></tr>
</table></td><td>Apply</td><td>8</td></tr>
<tr><td>10</td><td>Find f (1.6) using Lagrange's formula from the following table.
<table>
<tr><td>x</td><td>1.2</td><td>2.0</td><td>2.5</td><td>3.0</td></tr>
<tr><td>f(x)</td><td>1.36</td><td>0.58</td><td>0.34</td><td>0.20</td></tr>
</table></td><td>Apply</td><td>8</td></tr>
<tr><td>11</td><td>Find y(5) given that y(0)=1, y(1)=3, y(3)=13 and y(8) =123 using Lagrange's formula</td><td>Apply</td><td>8</td></tr>
<tr><td>12</td><td>Find y(10), given that y(5)=12, y(6)=13, y(9)=14, y(11)=16 using Lagrange's formula</td><td>Apply</td><td>8</td></tr>
<tr><td>13</td><td>A curve passes through the points (0, 18),(1,10), (3,-18) and (6,90). Find the slope of the curve at x = 2.</td><td>Apply</td><td>7</td></tr>
<tr><td>14</td><td>By the method of least square, find the straight line that best fits the following data:
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>y</td><td>14</td><td>27</td><td>40</td><td>55</td><td>68</td></tr>
</table></td><td>Apply</td><td>7</td></tr>
<tr><td>15</td><td>Fit a straight line y=a +bx from the following data:
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>y</td><td>1</td><td>1.8</td><td>3.3</td><td>4.5</td><td>6.3</td></tr>
</table></td><td>Understand</td><td>7</td></tr>
</table>

<table>
<tr><th>S. No</th><th>Question</th><th>Blooms Taxonomy Level</th><th>Course Outcome</th></tr>
<tr><td>16</td><td>Fit a straight line to the form y=a+bx for the following data:<table><tr><td>x</td><td>0</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td></tr><tr><td>y</td><td>12</td><td>15</td><td>17</td><td>22</td><td>24</td><td>30</td></tr></table></td><td>Understand</td><td>7</td></tr>
<tr><td>17</td><td>By the method of least squares, fit a second degree polynomial $y=a+bx+cx^2$ to the following data.<table><tr><td>x</td><td>2</td><td>4</td><td>6</td><td>8</td></tr><tr><td>y</td><td>3.07</td><td>12.85</td><td>31.47</td><td>57.38</td></tr></table></td><td>Understand</td><td>7</td></tr>
<tr><td>18</td><td>Fit a curve $y=a+bx+cx^2$ from the following data<table><tr><td>X</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Y</td><td>6</td><td>11</td><td>18</td><td>27</td></tr></table></td><td>Understand</td><td>7</td></tr>
<tr><td>19</td><td>Using the method of least squares find the constants a and b such that $y=ae^{bx}$ fits the following data:<table><tr><td>x</td><td>0</td><td>0.5</td><td>1</td><td>1.5</td><td>2</td><td>2.5</td></tr><tr><td>y</td><td>0.10</td><td>0.45</td><td>2.15</td><td>9.15</td><td>40.35</td><td>180.75</td></tr></table></td><td>Apply</td><td>7</td></tr>
<tr><td>20</td><td>Obtain a relation of the form $y=ab^x$ for the following data by the method of least squares.<table><tr><td>x</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>8.3</td><td>15.4</td><td>33.1</td><td>65.2</td><td>127.4</td></tr></table></td><td>Understand</td><td>7</td></tr>
<tr><td colspan="4">UNIT-IV
NUMERICAL TECHNIQUES</td></tr>
<tr><td>1</td><td>Find the real root of the equation x^3-x-4=0 by bisection method.</td><td>Apply</td><td>10</td></tr>
<tr><td>2</td><td>Find the real root of the equation $3x=e^x$ by bisection method.</td><td>Apply</td><td>10</td></tr>
<tr><td>3</td><td>Find the square root of 25 up to 2 decimal place s by using bisection method</td><td>Apply</td><td>10</td></tr>
<tr><td>4</td><td>Find a real root of the equation $e^x\sin x= 1$, using Regulafalsi method</td><td>Apply</td><td>10</td></tr>
<tr><td>5</td><td>Solve $xe^x=1$ by iterative method</td><td>Understand</td><td>10</td></tr>
<tr><td>6</td><td>Solve 2x=cosx+3 by iterative method</td><td>Understand</td><td>10</td></tr>
<tr><td>7</td><td>Find a real root of the equation, $\log x = \cos x$ using Regulafalsi method</td><td>Apply</td><td>10</td></tr>
<tr><td>8</td><td>Use the method of false position to find the fourth root of 32 correct to three decimal places</td><td>Apply</td><td>10</td></tr>
<tr><td>9</td><td>Find a real root of the equation 3x-cos$x$-1=0 using Newton Raphson method</td><td>Apply</td><td>10</td></tr>
<tr><td>10</td><td>Find a real root of the equation $e^x\sin x=1$, using Newton Raphson method.</td><td>Apply</td><td>10</td></tr>
<tr><td>11</td><td>Using Newton's iterative method find the real root of $x\log_{10}x = 1.2$ correct to four decimal places</td><td>Apply</td><td>10</td></tr>
<tr><td>12</td><td>Evaluate x tanx+1=0 by Newton Raphson method.</td><td>Understand</td><td>10</td></tr>
<tr><td>13</td><td>Find the square root of 28 by Newton Raphson method.</td><td>Apply</td><td>10</td></tr>
<tr><td>14</td><td>Solve x+3y+8z=4, x+4y+3z=-2, x+3y+4z=1 using LU decomposition</td><td>Understand</td><td>11</td></tr>
<tr><td>15</td><td>Solve by LU decomposition method x+y+z=9,2x-3y+4z=13,3x+4y+5z=40</td><td>Understand</td><td>11</td></tr>
<tr><td>16</td><td>Find the inverse of the matrix $\begin{bmatrix} 3 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 2 \end{bmatrix}$ by LU decomposition method</td><td>Apply</td><td>11</td></tr>
<tr><td>17</td><td>Solve 5x-y+3z=10,3x+6y=18,x+y+5z=-10 with initial approximations (3,0,-2) by Jacobi's iteration method</td><td>Understand</td><td>11</td></tr>
</table>

S. No	Question	Blooms Taxonomy Level	Course Outcome
18	Using Jacobi's iteration method solve the system of equation 10x+4y-2z=12, x-10y-z=-10,5x+2y-10z=-3	Understand	11
19	Solve 20x+y-2z=17,3x+20y-z=-18,2x-3y+20z=25 by Gauss-Seidel iterative method	Understand	11
20	Using Gauss-seidel iterative method solve the system of equations 5x+2y+z=12, x+4y+2z=15, x+2y+5z=20	Understand	11
UNIT-V NUMERICAL INTEGRATION AND NUMERICAL SOLUTIONS OF DIFFERENTIAL EQUATIONS			
1	Use the trapezoidal rule with n=4 to estimate $\int_0^1 \frac{dx}{1+x^2}$ correct to four decimal places	Understand	12
2	Estimate $\int_0^6 \frac{dx}{1+x^2}$ correct to four decimal places	Understand	12
3	Evaluate $\int_0^{\pi}\left(\frac{\sin x}{x}\right)dx$ by using i) Trapezoidal rule ii) Simpson's $\frac{1}{3}$ rule taking n=6	Understand	12
4	Using Taylor's series method, find an approximate value of y at x=0.2 for the differential equation $y'-2y=3e^x$ for y(0)=0.	Apply	13
5	Find y(0.1), y(0.2), z(0.1), z(0.2), given $\frac{dy}{dx}=x+z, \frac{dz}{dx}=x-y^2$ and y(0)=2, z(0)=1 by using Taylor's series method	Apply	13
6	Given $y^1=1+xy, y(0)=1$ compute y (0.1), y (0.2) using Picard's method	Understand	13
7	Find an approximation value of for x=0.1, 0.2 if $\frac{dy}{dx}=x+y$ and y(0)=1 using Picard's method and check your answer with exact particular solution	Apply	13
8	Solve by Euler's method $\frac{dy}{dx}=\frac{2y}{x}$ given y(1)=2 and find y(2).	Understand	13
9	Using Euler's method, solve for y at x=2 from $\frac{dy}{dx}=3x^2+1$, y(1)=2 taking step size: h=0.5 and h=0.25	Understand	13
10	Given $\frac{dy}{dx}=xy$ and y(0)=1. Find y(0.1) using Euler's method	Apply	13
11	Find y(0.5), y(1) and y(1.5) given that $\frac{dy}{dx}=4-2x$ and y(0)=2 with h=0.5 using modified Euler's method	Apply	13
12	Find y(0.1) and y(0.2) using Euler's modified formula given that $\frac{dy}{dx}=x^2-y$ and y(0)=1	Apply	13
13	Given y^1=4-2x,y(0)=2 then find y(0.5),y(1),y(1.5)using Euler's modified formula	Apply	13
14	Find y(0.1) and y(0.2) using Runge Kutta fourth order formula given	Apply	13

S. No	Question	Blooms Taxonomy Level	Course Outcome
	that $\frac{dy}{dx} = x + x^2 y$ and y(0)=1.		
15	Obtain the values y at x=0.1,0.2 usingRunge Kutta method of second and fourth order for y^1+y=0,y(0)=1	Understand	13
16	using Runge Kutta method of order 4 find y(0.2) for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0)=1, h=0.2$	Apply	13
17	Use power method find numerically largest Eigen value $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and corresponding Eigen vector and other Eigen value	Apply	14
18	Use power method find numerically largest Eigen value $\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$	Apply	14
19	Write the largest Eigen value of the matrix $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$	Understand	14
20	Solve the boundary value problem $y^{11}-2y(x)/x^2=-5/x, 1<x<2, y(1)=1; y(2)=2$; with h value of 0.5	Understand	14

3. Group - III (Analytical Questions)

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	UNIT-I VECTOR CALCULUS		
1	If $\bar{r} = x\bar{\imath} + y\bar{\jmath} + z\bar{k}$ then what is $\Delta^2(\frac{1}{r})$?	Understand	1
2	If curl $\bar{f} = \bar{0}$ then what is $\bar{f}$?	Understand	1
3	If $\bar{a}$ and $\bar{b}$ are irrotational vectors then what is $\bar{a}\ X\ \bar{b}$?	Understand	1
4	What is the physical interpretation of $\lvert\Delta\phi\rvert$?	Understand	1
5	If $div\ \bar{A} = 0$ then what is called $\bar{A}$?	Understand	1
6	What is $\int fog.d\,\bar{r}$?	Understand	2
7	What is the necessary and sufficient condition for the line integral $\int_c A.dr = 0$ for every closed curve c?	Understand	2
8	What is $\int \bar{r}\ X \bar{n} dS$?	Understand	2
9	$If\ \bar{F} = axi + byj + czk$ where a, b, c are constants then what is $\iint \bar{F}.\bar{n}\, dS$ where s is the surface of the unit sphere?	Evaluate	2
10	If $\bar{r} = x\bar{\imath} + y\bar{\jmath} + z\bar{k}$ then what is $\oint_c \bar{r}\,.\,d\bar{r}$?	Understand	2
	UNIT-II FOURIER SERIES AND FOURIER TRANSFORMS		
1	If $f(x)$ is an even function in the interval $-(l,\ l)$ then what is the value of b_n ?	Understand	5
2	If $f(x) = x$ in $(-\pi, \pi)$ then what is the Fourier coefficient a_2 ?	Understand	5
3	What are the conditions for expansion of a function in Fourier series?	Understand	4
4	If $f(x)$ is an odd function in the interval $-(l,\ l)$ then what are the	Apply	5

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	value of a_0, a_n ?		
5	If $f(x) = x^2$ in $-(l, l)$ then what is b_1 ?	Understand	5
6	What is the Fourier sine series for $f(x) = x$ in $(0, \pi)$?	Understand	5
7	What is the half range sine series for $f(x) = e^x$ in $(0, \pi)$?	Understand	5
8	What is the Fourier sine transform of $f(x) = x$?	Understand	6
9	What is the Fourier cosine transform of $f(x)$?	Understand	6
10	What is the $F_c\{e^{-at}\}$?	Understand	6
	UNIT-III INTERPOLATION AND CURVE FITTING		
1	For what values of y the Gauss backward interpolation formula is used to interpolate?	Evaluate	8
2	For what values of y the Gauss forward interpolation formula is used to interpolate?	Evaluate	8
3	What is the difference between interpolation and extrapolation	Understand	7
4	Write a short note on difference equation	Remember	7
5	Write about curve fitting	Remember	7
6	If $y = a + \frac{b}{x}$ is a curve then write it's normal equations	Analyze	7
7	If $y = a_0 + a_1 x + a_2 x^2$ then what is the third normal equation of $\sum x_i^2 y_i$ by least squares method?	Analyze	7
8	If $y = a_0 + a_1 x^2$, then what is the first normal equation of $\sum y_i$?	Analyze	7
9	If $y = ax^b$, then what is the first normal equation of $\sum \log y_i$?	Analyze	7
10	If $y = 2x + 5$ is the best fit for 6 pairs of values (x, y) by the best method of least-squares, find $\sum x_i$ if $\sum y_i = 120$?	Apply	7
	UNIT-IV NUMERICAL TECHNIQUES		
1	What is difference between polynomial and algebraic function?	Understand	10
2	What is Transcendental equation	Understand	10
3	Define root of an equation	Remember	10
4	What are the merits and demerits of Newton-Raphson Method	Understand	10
5	Explain about order of convergence?	Understand	10
6	Define linear, quadratic and cubic convergence?	Remember	10
7	Explain about False-position method	Understand	10
8	Explain about Regula-Falsi method	Understand	10
9	What is Crout's method in LU decomposition	Understand	11
10	What is Dolittle's method in LU decomposition	Understand	11
	UNIT-V NUMERICAL INTEGRATION AND NUMERICAL SOLUTIONS OF DIFFERENTIAL EQUATIONS		
1	How many number of subintervals are required to get accuracy, while evaluating a definite integral by trapezoidal rule?	Analyze	12
2	What is the interval h for closer application, in Simpson's $\frac{1}{3}$ rule?	Analyze	12
3	What is the disadvantage of picard's method?	Understand	13
4	What is the method of Runge-Kutta method?	Understand	13
	If $y_0 = 1, h = 0.2, f(x_0, y_0) = 1$ then by using Euler's method	Understand	13

S. No	Questions	Blooms Taxonomy Level	Program Outcome
5	what is the value of y_1 ?		
6	If $y_1 = 1.2, h = 0.2, f(x_{1,} y_1) = 1.4$ then by using Euler's method what is the value of y_2?	Understand	13
7	what is the iterative formula of Euler's method for solving $\frac{dy}{dx} = f(x, y)$with y(x_0)= y_0?	Understand	13
8	What is the n^{th} difference of a polynomial of degree n?	Understand	13
9	If $\frac{dy}{dx} = x - y$ and y(0)=1 then by picards method what is the value of $y^{(1)}$(x)?	Understand	13
10	What is the disadvantage of Euler's method over Modefied Euler method?	Understand	13

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