



INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad -500 043

FRESHMAN ENGINEERING

ASSIGNMENT

Course Name	MATHEMATICS-II
Course Code	A30006
Class	II B. Tech I Semester
Branch	Freshman Engineering
Year	2016 – 2017
Course Faculty	Dr. M. Anita, Professor Mr. Ch. Kumara Swamy, Asst Professor Ms. K.. Rama Jyothi, Asst Professor

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.

ASSIGNMENT – I & II

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome
ASSIGNMENT-I (SHORT ANSWER TYPE QUESTIONS) UNIT – I			
1	Define divergence?	Remember	1
2	Define curl?	Remember	1
3	Evaluate the angle between the normal to the surface $xy = z^2$ at the points (4,1,2) and (3,3,-3)?	Understand	1
4	Find a unit normal vector to the given surface $x^2y + 2xz = 4$ at the point (2,-2,3)?	Apply	1
5	If \vec{a} is a vector then prove that $\text{grad}(\vec{a}, \vec{r}) = \vec{a}$?	Understand	1
6	Prove that $F = yz\mathbf{i} + zx\mathbf{j} + xy\mathbf{k}$ is irrotational?	Analyze	1
7	Show that $(x+3y)\mathbf{i} + (y-2z)\mathbf{j} + (x-2z)\mathbf{k}$ is solenoidal?	Understand	1
8	Define line integral?	Remember	2
9	Define volume integral?	Remember	2
10	State Gauss divergence theorem?	Understand	3
(LONG ANSWER QUESTIONS) UNIT-I			
1	Prove that $\nabla f(r) = \frac{\vec{r}}{r} \cdot f'(r)$	Analyze	1

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome
2	Prove that $\text{div}(r^n \cdot \bar{r}) = (n+3)r^n$. Hence Show that $\frac{\bar{r}}{r^3}$ is solenoidal Vector	Analyze	1
3	If $\bar{F} = (5xy - 6x^2)\bar{i} + (2y - 4x)\bar{j}$ evaluate $\int_C \bar{F} \cdot d\bar{r}$ along the curve C in xy plane $y=x^3$ from (1,1) to (2,8).	Understand	2
4	Evaluate $\iint_S \bar{A} \cdot \bar{n} ds$ 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
5	Evaluate $\iint_S \bar{F} \cdot d\bar{s}$ if $f = yz\bar{i} + 2y^2\bar{j} + xz^2\bar{k}$ and S is the Surface of the Cylinder $x^2+y^2=9$ contained in the first Octant between the planes $z=0$ and $z=2$.	Understand	2
6	Verify gauss divergence theorem for the vector point function $F=(x^3-yz)\bar{i}-2yx\bar{j}+2z\bar{k}$ over the cube bounded by $x=y=z=0$ and $x=y=z=a$	Apply	3
7	Verify divergence theorem for $2x^2y\bar{i} - y^2\bar{j} + 4xz^2\bar{k}$ taken over the region of first octant of the cylinder $y^2 + z^2 = 9$ and $x = 2$	Apply	3
8	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
9	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
10	Verify Stokes theorem for $f = (x^2 - y^2)\bar{i} + 2xy\bar{j}$ over the box bounded by the planes $x=0, x=a, y=0, y=b, z=c$	Apply	3
(SHORT ANSWER TYPE QUESTIONS)			
UNIT-II			
1	Define Euler's formulae	Remember	5
2	Write Dirichlet's conditions	Understand	4
3	If $f(x) = x^2 - 2$ in $(-2,2)$ then find b_2	Apply	5
4	If $f(x) = x^2$ in $(-2,2)$ then a_0	Apply	5
5	If $f(x) = \sin^3 x$ in $(-\pi, \pi)$ then find a_n	Apply	5
6	If $f(x) = x^4$ in $(-1,1)$ then find b_n	Apply	5
7	Write about Fourier sine and cosine integral	Understand	6
8	Find the finite Fourier cosine transform of $f(x)=1$ in $0 < x < \pi$	Apply	6
9	Find the inverse finite sine transform $f(x)$ if $F_s(n) = \frac{1 - \cos n\pi}{n^2 \pi^2}$	Apply	6
10	Write the properties of Fourier transform	Understand	6
(LONG ANSWER QUESTIONS)			
UNIT-II			
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 $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$.	Understand	5
2	Find the Fourier Series to represent the function $f(x) = \sin x $ in $-\pi < x < \pi$.	Apply	5

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome														
3	Find the Fourier series to represent $f(x) = x^2$ in $(0, 2\pi)$.	Apply	5														
4	Expand the function $f(x) = x^2$ as a Fourier series in $(-\pi, \pi)$.	Understand	5														
5	Find the Fourier series to represent the function $f(x)$ given by: $f(x) = \begin{cases} 0 & \text{for } -\pi \leq x \leq 0 \\ x^2 & \text{for } 0 \leq x < \pi \end{cases}$	Apply	5														
6	Expand $f(x) = \cos x$ for $0 < x < \pi$ in half range sine series	Understand	5														
7	Using Fourier integral show that $e^{-x} \cos x = \frac{2}{\pi} \int_0^{\infty} \frac{\lambda^2 + 2}{\lambda^4 + 4} \cos \lambda x dx$	Understand	6														
8	Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2 & \text{if } x < a \\ 0 & \text{if } x > a \end{cases}$ Hence show that $\int_0^{\infty} \frac{\sin x - x \cos x}{x^3} dx = \frac{\pi}{4}$	Apply	6														
9	Find the Fourier sine transform for the function $f(x)$ given by $f(x) = \begin{cases} \sin x, & 0 < x < a \\ 0 & x \geq a \end{cases}$	Apply	6														
10	Find the inverse Fourier transform $f(x)$ of $F(p) = e^{- p y}$	Apply	6														
(SHORT ANSWER TYPE QUESTIONS)																	
UNIT-III																	
1	Define Interpolation and extrapolation	Remember	7														
2	Explain forward difference interpolation	Understand	7														
3	Construct a forward difference table for $f(x) = x^3 + 5x - 7$ if $x = -1, 0, 1, 2, 3, 4, 5$	Analyze	9														
4	Evaluate $\Delta \log f(x)$	Understand	9														
5	Find the missing term in the following table <table border="1" style="display: inline-table; vertical-align: middle;"> <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>3</td> <td>9</td> <td>-----</td> <td>81</td> </tr> </table>	X	0	1	2	3	4	Y	1	3	9	-----	81	Apply	8		
X	0	1	2	3	4												
Y	1	3	9	-----	81												
(LONG ANSWER QUESTIONS)																	
UNIT-III																	
1	<table border="1" style="display: inline-table; vertical-align: middle;"> <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.	x	20	25	30	35	40	45	y	354	332	291	260	231	204	Apply	8
x	20	25	30	35	40	45											
y	354	332	291	260	231	204											
2	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	Apply	8														
3	The population of a town in the decadal census was given below. Estimate the population for the year 1895 <table border="1" style="display: inline-table; vertical-align: middle;"> <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>	Year (x)	1891	1901	1911	1921	1931	Population (y)	46	66	81	93	101	Understand	8		
Year (x)	1891	1901	1911	1921	1931												
Population (y)	46	66	81	93	101												
4	Find by Gauss's backward interpolating formula the value of y at $x = 1936$ using the following table <table border="1" style="display: inline-table; vertical-align: middle;"> <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>	X	1901	1911	1921	1931	1941	1951	Y	12	15	20	27	39	52	Apply	8
X	1901	1911	1921	1931	1941	1951											
Y	12	15	20	27	39	52											
5	Find $f(1.6)$ using Lagrange's formula from the following table.	Apply	8														

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome														
	<table border="1"> <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>	x	1.2	2.0	2.5	3.0	f(x)	1.36	0.58	0.34	0.20						
x	1.2	2.0	2.5	3.0													
f(x)	1.36	0.58	0.34	0.20													
ASSIGNMENT – II																	
(SHORT ANSWER TYPE QUESTIONS)																	
UNIT-III																	
1	What is the principle of method of least square	Understand	9														
2	Define curve fitting	Remember	8														
3	Derive the normal equations for straight line	Understand	8														
4	Derive the normal equations for second degree parabola	Understand	8														
5	Write the normal equations to fit the curve $y = ae^{bx}$	Understand	8														
(LONG ANSWER QUESTIONS)																	
UNIT-III																	
1	A curve passes through the points (0, 18), (1, 10), (3, -18) and (6, 90). Find the slope of the curve at $x = 2$.	Apply	7														
2	By the method of least square, find the straight line that best fits the following data:	Apply	7														
	<table border="1"> <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>	x	1	2	3	4	5	y	14	27	40	55	68				
x	1	2	3	4	5												
y	14	27	40	55	68												
3	Fit a curve $y = a + bx + cx^2$ from the following data	Understand	7														
	<table border="1"> <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>	X	1	2	3	4	Y	6	11	18	27						
X	1	2	3	4													
Y	6	11	18	27													
4	Using the method of least squares find the constants a and b such that $y = ae^{bx}$ fits the following data:	Apply	7														
	<table border="1"> <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>	x	0	0.5	1	1.5	2	2.5	y	0.10	0.45	2.15	9.15	40.35	180.75		
x	0	0.5	1	1.5	2	2.5											
y	0.10	0.45	2.15	9.15	40.35	180.75											
5	Obtain a relation of the form $y = ab^x$ for the following data by the method of least squares.	Understand	7														
	<table border="1"> <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>	x	2	3	4	5	6	y	8.3	15.4	33.1	65.2	127.4				
x	2	3	4	5	6												
y	8.3	15.4	33.1	65.2	127.4												
(SHORT ANSWER TYPE QUESTIONS)																	
UNIT-IV																	
1	Define algebraic and transcendental equation and give example	Remember	10														
2	Write about bisection method	Understand	10														
3	Write about false position method	Understand	10														
4	State the condition for convergence of the root by iterative method	Understand	10														
5	Find the square root of a number 16 by using Newton's Raphson	Apply	10														
6	Explain LU decomposition method	Apply	11														
7	Define Crout's and Doolittle's method	Remember	11														
8	If $A = LU$ and $A = \begin{bmatrix} 1 & 5 \\ 2 & 3 \end{bmatrix}$ then find L	Apply	11														
9	Explain the procedure to find the inverse of the matrix by using LU decomposition method	Understand	11														
10	Write the difference between Jacobi's and Gauss Seidel iterative method	Understand	11														

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome
(LONG ANSWER QUESTIONS)			
UNIT-IV			
1	Find the square root of 25 up to 2 decimal places by using bisection method	Apply	10
2	Find a real root of the equation $e^x \sin x = 1$, using Regula-falsi method	Apply	10
3	Solve $2x = \cos x + 3$ by iterative method	Understand	10
4	Find a real root of the equation, $\log x = \cos x$ using Regula-falsi method	Apply	10
5	Find a real root of $3x - \cos x - 1 = 0$ using Newton Raphson method	Apply	10
6	Evaluate $x \tan x + 1 = 0$ by Newton Raphson method.	Understand	10
7	Solve $x + 3y + 8z = 4$, $x + 4y + 3z = -2$, $x + 3y + 4z = 1$ using LU decomposition	Understand	11
8	Solve $5x - y + 3z = 10$, $3x + 6y = 18$, $x + y + 5z = -10$ with initial approximations (3,0,-2) by Jacobi's iteration method	Understand	11
9	Using Jacobi's iteration method solve the system of equation $10x + 4y - 2z = 12$, $x - 10y - z = -10$, $5x + 2y - 10z = -3$	Understand	11
10	Using Gauss-seidel iterative method solve the system of equations $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$	Understand	11
(SHORT ANSWER TYPE QUESTIONS)			
UNIT-V			
1	Explain Trapezoidal rule	Understand	12
2	Explain Simpson's 1/3 and 3/8 rule	Understand	12
3	Estimate $\int_0^{\pi/2} e^{\sin x} dx$ taking $h = \pi/6$ correct to four decimal places	Understand	12
4	Explain two point and three point Gaussian quadrature	Understand	12
5	Compute using Gauss integral $\int_{-1}^1 \sqrt{1-x^2} dx, n = 3$	Apply	12
6	Explain Taylor's series method and limitations	Understand	13
7	Explain Picard's method of successive approximation Write the second approximation for $y' = x^2 + y^2, y(0) = 1$	Understand	13
8	Give the difference between Euler's method and Euler's modified method	Analyze	13
9	Find $y(0.1)$ given $y' = x^2 - y, y(0) = 1$ by Euler's method	Apply	13
10	Explain Runge-Kutta second and classical fourth order	Understand	13
(LONG ANSWER QUESTIONS)			
UNIT-V			
1	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

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome
2	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
3	Given $y' = 1 + xy, y(0) = 1$ compute y (0.1), y (0.2) using Picard's method	Understand	13
4	Solve by Euler's method $\frac{dy}{dx} = \frac{2y}{x}$ given $y(1)=2$ and find $y(2)$.	Understand	13
5	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
6	Find $y(0.1)$ and $y(0.2)$ using Runge Kutta fourth order formula given that $\frac{dy}{dx} = x + x^2 y$ and $y(0)=1$.	Apply	13
7	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
8	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
9	Use power method find numerically largest Eigen value $\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$	Apply	14
10	Write the largest Eigen value of the matrix $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$	Understand	14

Prepared By : Mr. Ch. Kumara Swamy, Asst Professor
: Ms. K. Rama Jyothi, Asst Professor

Date : 10 June, 2016

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