Subject Code: R161109/R16 **Set No - 1**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Mathematical Methods)
(Com. to CSE, IT, Agri Engg.)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
*****

PART A

1. a) Find real root of the equation $3x = e^x$ by using Bisection method up to 3 approximations.

   b) Show that $e^x\left(u_0 + x\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_0 + \ldots\right) = u_0 + u_1 x + u_2 \frac{x^2}{2!} + \ldots$

   c) Evaluate $\int_0^1 \frac{dx}{1+x}$ using Trapezoidal rule.

   d) Explain about Dirichlet's conditions for a Fourier expansion.

   e) The temperatures at one end of a bar OA of 50 cm length with insulated sides are kept at $0^o C$ at O and $100^o C$ at A until steady state conditions prevail. Find steady state temperature.

   f) If $F(p)$ is the complex Fourier transform of $f(x)$ then prove that

   $$F\{f(ax)\} = \frac{1}{a}F\left(\frac{p}{a}\right), a > 0.$$

   g) Using Newton-Raphson method find square root of a number. (7×2 = 14M)

PART B

2. a) Solve $x^3 = 2x + 5$ for a positive root by regula-falsi method.

   b) Solve the system of equations by Newton Raphson method $3yx^2 - 10x + 7 = 0$ and $y^2 - 5y + 4 = 0$. (7M+7M)

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3. a) Fit a interpolating polynomial in x for the following data

x	1	4	6	8	10
y	1	7	9	12	21

b) Using Lagrange's formula fit a polynomial to the data

x	0	2	5	9
f(x)	1	12	15	33

(7M+7M)

4. a) Evaluate $\int_0^2 \frac{dx}{x^3+x+1}$ by using Simpson's 1/3rd rule with h= 0.25.

b) Evaluate *y(0.8)* using Runge Kutta method given $y' = (x+y)^{1/2}$, y(0.4)= 0.41

(7M+7M)

5. a) Find the Fourier series of *xcosx* for $0<x<2\pi$.

b) Find half range Fourier sine series of $f(x) = \pi - x$ in $[0,\pi]$.

(7M+7M)

6. A tightly stretched flexible string has its ends fixed at x=0 and x= 10. At time t=0, the string is given a shape defined by f(x) = kx(10-x), where k is a constant and then released. Find the displacement of any point x of the string at any time.

(14M)

7. a) Find the Fourier transform of $\frac{1}{\sqrt{|x|}}$.

b) Find the inverse Fourier transform of f(x) of $F_s(p) = \frac{p}{1+p^2}$

(7M+7M)

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Subject Code: R161109/R16 **Set No - 2**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Mathematical Methods)
(Com. to CSE, IT, Agri Engg.)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
*****

PART A

1. a) Find positive root of the equation $x^3 - 2x - 5 = 0$ using Regula-Falsi method. Carry out two approximations.

b) Find the missing term in the following table

X	0	1	2	3	4
Y	1	3	9	-	81

c) The table below shows the temperature $f(t)$ as a function of time:

t	1	2	3	4	5	6	7
$f(t)$	81	75	80	83	78	70	60

Using Simpson's $\frac{1}{3}$rd rule, evaluate $\int_1^7 f(t)dt$.

d) Expand the function $f(x) = x^3$ as a Fourier series in $-\pi \le x \le \pi$.

e) Write One-Dimensional wave equation with initial and Boundary conditions.

f) If $F_s(p)$ and $F_c(p)$ are the Fourier sine and cosine transforms of $f(x)$ respectively, then prove $F_s[f(x)\cos ax] = \frac{1}{2}[F_s(p+a) + F_s(p-a)]$.

g) Evaluate (i) $\Delta^2 e^{2x+3}$ (ii) $\Delta^2 \cos 2x$. (7×2 = 14M)

PART B

2. a) Using Regula-falsi method, find the real root of $2x - \log x = 6$ correct to three decimal places.

b) Solve the system of equations by Newton Raphson method $x^2 + y^2 - 1 = 0$ and $y - x^2 = 0$. (7M+7M)

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3. a) Fit a interpolating polynomial in x for the following data

x	0	1	2	3	4
y	-3	3	4	27	57

b) Find Interpolating polynomial by Lagrange's method and hence find f(2) for the following data

x	0	1	3	4
f(x)	-12	0	6	12

(7M+7M)

4. a) Evaluate $\int_0^{0.6} e^{-x^2} dx$ by using Simpson's 1/3rd rule with h= 0.1.

b) Find y(74) given that *y(50)= 201, y(60)= 225, y(70)=248 and y(80)=274.* Using Newton's difference formula.

(7M+7M)

5. a) Expand cosπx in (0,1) as Fourier sine series.

b) Obtain the Fourier sin series of f(x) = e^{-x} in the interval 0<x< 2π. (7M+7M)

6. The ends A and B of a rod 20 cm long have the temperature at 30^0 C and 80^0 until steady states prevail. The temperatures of the ends are change at 40^0C and 60^0C respectively. Find the temperature distribution in the rod at time *t*.

(14M)

7. a) Find the Fourier sine and cosine transform of $f(x) = \frac{1}{1+x^2}$.

b) Find the inverse Fourier cosine transform of $F_c(p) = p^n e^{-ap}$.

(7M+7M)

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Subject Code: R161109/R16 **Set No - 3**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Mathematical Methods)
(Com. to CSE, IT, Agri Engg.)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
*****

PART A

1. a) Using Newton-Raphson method find reciprocal of 18.

b) The function $y = \sin x$ is tabulated below

x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$
$y = \sin x$	0	0.70711	1.0

Using Lagrange's interpolation formula, find the value of $\sin\left(\frac{\pi}{6}\right)$.

c) Solve numerically using Euler's method $y' = y^2 + x, y(0) = 1$. Find $y(0.1)$ and $y(0.2)$.

d) Express $f(x) = x$ as a Half range sine series in $0 < x < 2$.

e) Solve $u_x - 4u_y = 0, u(0, y) = 8e^{-3y}$ by the method of separation of variables.

f) Find finite Fourier cosine transform of $f(x) = x, 0 < x < 4$.

g) Using Euler's method find an approximate value of y corresponding to $x = 0.4$ given that $\frac{dy}{dx} = x + y$ and $y = 1$ at $x = 0$. (7×2 = 14M)

PART B

2. a) Find a real root of the equation $x^3 - 4x - 9 = 0$ using False position method correct to three decimal places.

b) Solve the system of equations by Newton Raphson method $3yx^2 - 10x + 7 = 0$ and $y^2 - 5y + 4 = 0$. (7M+7M)

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3. a) From the following table of half yearly premium for policies at different ages, estimate the premium for policies at the age of 63.

Age x	45	50	55	60	65
Premium y	114.84	96.16	83.32	74.48	68.48

b) Apply Lagrange's formula to find f(5) given that f(1)=2, f(2)=4, f(4)=16 and f(7)=128.

(7M+7M)

4. a) Evaluate $\int_0^6 \frac{e^x\,dx}{x+1}$ by using Simpson's 1/3rd rule with h= 1.

b) Evaluate *y(0.1)* and *y(0.2)* using Runge Kutta method given $y^1 = xy + y^2$, *y(0)= 1.*

(7M+7M)

5. a) Find the Fourier series of the function f(x) = |sin x| in [-1, 1].

b) Obtain the Fourier cosine series of $f(x) = e^{-x}$ in the interval $0<x< 2\pi$.

(7M+7M)

6. The ends A and B of a rod of length 20 cm have the temperatures at 30°C and 80°C until steady state conditions prevails. The temperature of the ends is changed to 40°C and 60°C respectively. Find the temperature distribution in the rod at time t.

(7M+7M)

7. a) Find Fourier transform of f(x) defined by $f(x) = e^{-x^2/2}, -\infty < x < \infty$.

b) Find the inverse Fourier cosine transform of $F_c(p) = \frac{\sin ap}{p}$.

(7M+7M)

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Subject Code: R161109/R16 **Set No - 4**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Mathematical Methods)
(Com. to CSE, IT, Agri Engg.)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
*****

PART A

1. a) By the fixed point iteration process, find the root correct to two decimal places of the equation $x = \cos x$ near $x = \frac{\pi}{4}$.

   b) Prove that $\mu^2 = 1 + \frac{\delta^2}{4}$

   c) Write merits and demerits of Runge-Kutta method.

   d) Find Fourier series for the function $f(x) = |x|, -\pi < x < \pi$.

   e) Solve $4u_x + u_y = 0$ and u (0,y) = e^{-5y} by the method of separation of variables.

   f) Find finite Fourier sine transform of $f(x) = x, 0 < x < \pi$.

   g) Write the formula for half range cosine series expansion of f(x) in (0,*l*). (7×2 = 14M)

PART B

2. a) Using regula-falsi method, find the real root of $2x - \log x = 6$ correct to three decimal places.

   b) Solve the system of equations by Newton Raphson method $3yx^2 - 10x + 7 = 0$ and $y^2 - 5y + 4 = 0$.

(7M+7M)

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3. a) Using Lagrange's Interpolation formula find the value of y(10) from the following table

x	5	6	9	11
y(x)	12	13	14	16

b) Fit a interpolating polynomial in x for the following data

x	0	1	2	3	4
y	3	5	6	9	17

(7M+7M)

4. a) Evaluate $\int_1^7 \frac{e^x\,dx}{x+1}$ by using Simpson's 1/3rd rule with h=1.

b) Using Runge-Kutta fourth order formula, find $y(0.2)$ for the equation $y^1 = \frac{y-x}{y+x}$ $y(0)=1$ taking h=0.1.

(7M+7M)

5. a) Find the Fourier series of the function f(x) = e^x in [0,2].

b) Obtain the Fourier sine series of f(x) = $xsinx$ in the interval 0<x< π.

(7M+7M)

6. A tightly stretched flexible string has its ends fixed at x=0 and x= 10. At time t=0, the string is given a shape defined by f(x) = kx(10-x), where k is a constant and then released. Find the displacement of any point x of the string at any time.

(14M)

7. a) Find Fourier cosine transform of $f(x) = \frac{e^{-ax}}{x}$

b) Find the inverse Fourier cosine transform of $F_c(p) = p^n e^{-ap}$.

(7M+7M)

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Subject Code: R161110/R16 **Set No - 1**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Numerical Methods and Complex Variables)
(Com. to ECE, EIE, E.Com.E.)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
*****

PART-A

1. a) What is transcendental equation? Given an example.
   b) What is the difference between interpolation and extrapolation?
   c) Find y (0.1) by Taylor's series method for $y^1 = y - x$, y(0) = 1
   d) Show that the function $e^x(\cos y + i\sin y)$ is holomorphic
   e) State the Cauchy's theorem.
   f) Evaluate $\int_0^{1+i} (x^2 - iy)dz$ along the path y = x
   g) Find the Pole and residue of $f(z) = \frac{e^z}{(z-1)^2}$

[2+2+2+2+2+2+2]

PART-B

2. a) Find the Real root of the equation tanx = x using Bisection method.
   b) Find the Real root of the equation $x + \log_{10} x - 2 = 0$ using false position method. [7+7]

3. a) Estimate the minimum weight of bib taps when bore is 20 mm using the following table

Bore(mm)	8	10	15	25	32	40	50
Weight of bib taps in kg	0.25	0.30	0.40	1.25	1.70	2.15	3.65

   b) Determine the value of f(x) at x = 25 for the following data [7+7]

x	20	24	28	32
y=f(x)	24	32	35	40

4. a) Evaluate $\int_0^{\frac{\pi}{2}} e^{\sin x} dx$ by (i) Trapezoidal rule (ii) Simpson's 1/3rd Rule [7+7]
   b) Find y (0.1) for the D.E $\frac{dy}{dx} = xy^2, y(0) = 1$ using RK method of fourth order

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5. a) Find the Analytic function whose real part is $u(x, y) = \dfrac{\sin 2x}{\cosh 2y + \cos 2x}$

   b) Show that the function f(z) = $z\bar{z}$ is differentiable but not analytic at origin. [7+7]

6. a) Using Cauchy's integral formula, evaluate $\int_c \dfrac{\cosh \pi z}{z(z^2+1)} dz$, where c is $|z| = 2$ [7+7]

   b) Express $f(z) = \dfrac{z}{(z-1)(z-3)}$ in a series of positive and negative powers of (z-1)

7. a) Evaluate $\int_0^\infty \dfrac{\cos x}{(1+x^2)^2} dx$

   b) Evaluate $\int_C \dfrac{e^z}{(z^2+\pi^2)^2} dz$

   Where C is $|z| = 4$ by using residue theorem [7+7]

Subject Code: R161110/R16 **Set No - 2**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Numerical Methods and Complex Variables)
(Com. to ECE, EIE, E.Com.E.)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
*****

PART-A

1. a) What is Algebraic equation? Given an example.

   b) Prove that $\nabla = 1 - E^{-1}$

   c) Explain single step method with simple example?

   d) Determine whether the function $2xy + i(x^2 - y^2)$ is analytic.

   e) Evaluate $\int_0^{1+i} (x^2 - iy)dz$ along the path y = x^2

   f) Obtain Taylor's series for f(z) = e^z about z = 1

   g) Find the Pole and residue of f $f(z) = \frac{z}{(z^2 - 4)}$

[2+2+2+2+2+2+2]

PART-B

2. a) Find the Real root of the equation $x^2 - x - 4 = 0$ using iteration method [7+7]

   b) Find the Real root of the equation $e^{2x} - e^x - 2 = 0$ using Newton Raphson method

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3. a) The viscosity of an oil is experimentally measured at different temperatures as shown in the following table

Temp in ^{0}C	110	130	160	190
Viscosity	10.8	8.1	5.5	4.8

Find the Viscosity of the oil at the Temperature of 140 ^{0}C

b) Determine the value of f(x) at x = 10 for the following data [7+7]

x	2	5	9	11
y=f(x)	94.8	87.9	81.3	75.1

4. a) Evaluate $\int_0^1 \log x.\cos x dx$ by (i) Trapezoidal rule (ii) Simpson's 3/8th Rule [7+7]

b) Find y (0.1) for the D.E $\frac{dy}{dx} = x^2 y - 1, y(0) = 1$ using Taylor's series method

5. a) Define analytic function and Verify the whether $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}, (z \neq 0)$ and f(0) = 0 ,is analytic [7+7]

b) Define Harmonic function and verify whether $u(x,y) = e^{2x}(xcos2y - ysin2y)$ is harmonic and find its harmonic conjugate.

6. a) Evaluate $\oint \left[\frac{e^z}{z^3} + \frac{z^4}{(z+i)^2}\right] dz$, where $c: |z| = 2$ [7+7]

b) Expand $f(z) = \frac{z+3}{z(z^2-z-2)}$ in power series where (i) $|z| < 1$ (ii) $1 < |z| < 2$ (iii)$|z| > 2$

7. a) Evaluate $\int_0^{2\pi} \frac{d\theta}{5 - 4\sin\theta}$ [7+7]

b) Evaluate $\int_c \frac{z\cos z}{\left(z - \frac{\pi}{2}\right)^3} dz$ where C is the Region bounded by $|z-1| = 1$ using Residue theorem

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Subject Code: R161110/R16 **Set No - 3**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Numerical Methods and Complex Variables)
(Com. to ECE, EIE, E.Com.E.)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
*****

PART-A

1. a) what is an iterative process , why should we apply iterative technique

   b) Define Newton forward interpolation formula

   c) When do you use numerical integration? Give an example

   d) Find the analytic function whose real part is $\frac{x}{x^2+y^2}$

   e) Evaluate $\int_0^{1+i} (x^2+iy)dz$ along the path y = x

   f) Obtain Taylor's series for f(z) = $1/z^2$ about z = 1

   g) Find the Singularity of the function f(z) = $e^{1/z}$

[2+2+2+2+2+2+2]

PART-B

2. a) Find the Real root of the equation $2x^3-3x-4=0$ using Newton Raphson method

   b) Find the Real root of the equation $4\sin x = e^x$ using false position method [7+7]

3. a) Determine the value of f(x) at x = 225 form the following data [7+7]

x	50	100	150	200	250
y = f(x)	5	5.7	7.7	8.9	10.7

   b) Calculate f(3) from the following table

x	0	1	2	4	5	6
Y=f(x)	1	14	15	5	6	19

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4. a) Evaluate $\int_0^{\frac{\pi}{2}} \frac{\cos x}{1+x} dx$ by (i) Simpson's 3/8th Rule (ii) Simpson's 1/3rd Rule [7+7]

   b) Find y (0.1) for the D.E $\frac{dy}{dx} = x + y + xy, y(0) = 1$ using Modified Euler's method

5. a) Show that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) log\left|f'(z)\right| = 0,$ where f(z) is analytic function. [7+7]

   b) If f (z) = u + iv is analytic and $v = \frac{2\sin x \sin y}{\cos 2x + \cosh 2y}$, find u.

6. a) Evaluate $\int_c \frac{ze^{2z}}{(z-2)^3} dz$ where c is the circle with radius 3 by Cauchy integral formula

   b) Obtain Laurent's expansion for $f(z) = \frac{1}{(z+2)(z+1)}$ in $1 < |z| < 2$ [7+7]

7. a) Evaluate $\int_0^{2\pi} \frac{d\theta}{3 - 2\sin\theta}$ using residue theorem

   b) Find the Residue of $\frac{1+e^z}{z\cos z + \sin z}$ at z = 0 [7+7]

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Subject Code: R161110/R16 **Set No - 4**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Numerical Methods and Complex Variables)
(Com. to ECE, EIE, E.Com.E.)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
*****

PART-A

1. a) What are possible ways of finding the roots of nonlinear equation

   b) What are the applications of interpolation?

   c) Write the merits and demerits of Euler's method?

   d) Prove that an analytic function with constant imaginary part is constant.

   e) Evaluate $\int_0^{1+i} (x^2 + iy)dz$ along the path y = x^2

   f) Obtain Taylor's series for f(z) = 1/z about z = 1

   g) Define Removable singularity and give an example

[2+2+2+2+2+2+2]

PART-B

2. a) Find the Real root of the equation $x^2 - x - 2 = 0$ using iteration method [7+7]

   b) Find the Real root of the equation $e^x - 4x^2 = 0$ using Bisection method

3. a) Determine the value of f(x) at x = 1.6 form the following data [7+7]

x	1	1.4	1.8	2.2
y=f(x)	3.49	4.82	5.96	6.5

   b) Using Lagrange's Interpolation, find f(12) given that

x	3	7	9	13
y	5	12	13	21

|''|''|||''|'''|||'|

4. a) Evaluate $\int_0^{\frac{\pi}{2}} \sin x \log(\sin x) dx$ by (i) Trapezoidal rule (ii) Simpson's 1/3rd Rule [7+7]

   b) Find y (0.1) for the D.E $\frac{dy}{dx} = \frac{x^2}{y^2+1}, y(0) = 1$ using Picard's method

5. a) Show that for the function $f(z) = \begin{cases} \frac{z^5}{|z|^4}, z \neq 0 \\ 0, z = 0 \end{cases}$ Cauchy- Riemann equation are satisfied at z = 0,but $f(z)$ is not differentiable at 0. [7+7]

   b) Show that the function $f(x, y) = x^3 y - xy^3 + xy + x + y$ can be the imaginary part of an analytic function of f(z) also find the real part of the complex function

6. a) Evaluate $\int_c \frac{ze^{2z}}{(z-\pi i)^3} dz$ where c is the circle with radius 4 by Cauchy integral formula

   b) Obtain Laurent's expansion for $f(z) = \frac{1}{(z+2)^2(z+1)}$ in $|z| > 2$ [7+7]

7. a) Evaluate $\int_0^{\infty} \frac{dx}{(x^4+1)}$

   b) Find the residue of $f(z) = \frac{z^3}{(z-2)(z-3)(z-1)^4}$ at z = 1 [7+7]