F 3621 (Pages : 4) Reg. No..................................

Name..................................

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Common to all Branches except C.S. and I.T.

EN 010 501-A—ENGINEERING MATHEMATICS—IV

(Regular/Improvement/Supplementary)

[New Scheme—2010 Admission onwards]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. An electrostatic field in the xy-plane is given by the potential function $\phi = 3x^2y - y^3$, find the stream function.

2. Find the image of the circle $|z-1| = 1$ in the complex plane under the mapping $w = \frac{1}{z}$.

3. Find the real root of the equation $x^2 - 2x - 5 = 0$ by the method of false position correct to 3 decimal places.

4. Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ in the range $0 \le x \le 3$ by taking $h = 0.1$ by the modified Euler's method.

5. Construct the dual of the L.P.P.

   Maximize $z = 4x_1 + 9x_2 + 2x_3$

   subject to $2x_1 + 3x_2 + 2x_3 \le 7, 3x_1 - 2x_2 + 4x_3 = 5 ; x_1, x_2, x_3 \ge 0.$

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Show that $\sqrt{|xy|}$ is not analytic at the origin, although Cauchy-Riemann equations are satisfied at the point.

7. Find the Taylor's series expansion of $f(z) = \frac{2z^3 + 1}{z^2 + z}$ about $z = i$.

Turn over

8. Find by the iteration method, a real root of $2x - \log_{10}x = 7$.

9. Solve $\frac{dy}{dx} = x + z, \frac{dz}{dx} = x - y^2$ with $y(0) = 2$, $z(0) = 1$ to get $y(0.1)$, $y(0.2)$, $z(0.1)$ and $z(0.2)$ approximately by Taylor's series.

10. Using graphical method, solve the following L.P.P.

Maximize $z = 2x_1 + 3x_2$

subject to $x_1 - x_2 \le 2$

$x_1 + x_2 \ge 4,$

$x_1, x_2 \ge 0.$

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Determine the analytic function $f(z) = u + iv$ if $u - v = \frac{\cos x + \sin x - e^{-y}}{2(\cos x - \cosh y)}$ and $f(\pi/2) = 0$.

(6 marks)

(b) Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. Hence find the image of $|z| < 1$.

(6 marks)

Or

12. (a) Prove that the function $f(z)$ defined by $f(z) = \frac{x^3(1+i) - y^3 1 - i}{x^2 + y^2}$, $z \ne 0$ and $f(0) = 0$ is continuous and the Cauchy-Riemann equations are satisfied at the origin, yet $f'(0)$ does not exist.

(6 marks)

(b) Show that the transformation $w = \frac{3-z}{z-2}$ transforms the circle with center $\left(\frac{5}{2}, 0\right)$ and radius $\frac{1}{2}$ in the z-plane into the imaginary axis in the w-plane and the interior of the circle into the right half of the plane.

(6 marks)

13. (a) Evaluate $\int_C \frac{z-3}{z^2+2z+5}\,dz$, where C is the circle (i) $|z| = 1$; (ii) $|z+1-i| = 2$; (iii) $|z+1+i| = 2$.

(8 marks)

(b) Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and the residue at each pole.

(4 marks)

Or

14. (a) Find the Laurent's expansion of $f(z) = \frac{7z-2}{(z+1)\,z\,(z-2)}$ in the region $1 < |z+1| < 3$. (5 marks)

(b) Show the method of residues, that $\int_0^{\pi} \frac{a}{a^2 + \sin^2 \theta}\, d\theta = \frac{\pi}{\sqrt{1+a^2}}$. (7 marks)

15. (a) Using Newton's iterative method, find the real root of $x \log_{10} x = 1.2$ correct to five decimal places.

(6 marks)

(b) Solve by Gauss-Seidel method :

$$10x + 2y + z = 9$$
$$2x + 20y - 2z = -44$$
$$-2x + 3y + 10z = 22.$$

(6 marks)

Or

16. (a) Find a real root of the equation $x^3 - x - 11 = 0$, correct to 4 decimal places using the bisection method.

(6 marks)

(b) Find the root of the equation $\cos x - xe^x = 0$ by secant method correct to four decimal places.

(6 marks)

17. Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = yz + x$, $\frac{dz}{dx} = xz + y$ given that $y(0) = 1$, $z(0) = -1$ for $y(0.2)$, $z(0.2)$.

Or

18. Apply Milne's method, to find a solution of the differential equation $y' = x - y^2$ in the range $0 \le x \le 1$ for the boundary condition $y = 0$ at $x = 0$.

19. (a) What is the maximization transport problem ? How do you solve it ? (3 marks)

(b) Using simplex method solve the LPP

Maximize $z = 5x_1 + 3x_2$

subject to $x_1 + x_2 \le 2$

$5x_1 + 2x_2 \le 10$

$3x_1 + 8x_2 \le 12,$

$x_1, x_2 \ge 0.$

(9 marks)

Or

20. Find the initial basic feasible solution of the following transportation problem by Vogel's approximation method (VAM). Here, F_1, F_2 and F_3 are factories, and W_1, W_2 and W_3 are warehouses.

	W_1	W_2	W_3	W_4	*Production of Factories*
F_1	21	16	25	13	11
F_2	17	18	14	23	13
F_3	32	27	18	41	19
Capacity of the warehouse	6	10	12	15	43

(5 × 12 = 60 marks)

F 3621 (Pages : 4) Reg. No..............................

Name..............................

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Common to all Branches except C.S. and I.T.

EN 010 501-A—ENGINEERING MATHEMATICS—IV

(Regular/Improvement/Supplementary)

[New Scheme—2010 Admission onwards]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. An electrostatic field in the xy-plane is given by the potential function $\phi = 3x^2y - y^3$, find the stream function.

2. Find the image of the circle $|z-1| = 1$ in the complex plane under the mapping $w = \frac{1}{z}$.

3. Find the real root of the equation $x^2 - 2x - 5 = 0$ by the method of false position correct to 3 decimal places.

4. Solve $\frac{dy}{dx} = 1 - y$, $y(0) = 0$ in the range $0 \le x \le 3$ by taking $h = 0.1$ by the modified Euler's method.

5. Construct the dual of the L.P.P.

   Maximize $z = 4x_1 + 9x_2 + 2x_3$

   subject to $2x_1 + 3x_2 + 2x_3 \le 7, 3x_1 - 2x_2 + 4x_3 = 5 ; x_1, x_2, x_3 \ge 0$.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Show that $\sqrt{|xy|}$ is not analytic at the origin, although Cauchy-Riemann equations are satisfied at the point.

7. Find the Taylor's series expansion of $f(z) = \frac{2z^3 + 1}{z^2 + z}$ about $z = i$.

Turn over

8. Find by the iteration method, a real root of $2x - \log_{10}x = 7$.

9. Solve $\frac{dy}{dx} = x + z, \frac{dz}{dx} = x - y^2$ with $y(0) = 2$, $z(0) = 1$ to get $y(0.1)$, $y(0.2)$, $z(0.1)$ and $z(0.2)$ approximately by Taylor's series.

10. Using graphical method, solve the following L.P.P.

Maximize $z = 2x_1 + 3x_2$

subject to $x_1 - x_2 \leq 2$

$x_1 + x_2 \geq 4,$

$x_1, x_2 \geq 0.$

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Determine the analytic function $f(z) = u + iv$ if $u - v = \frac{\cos x + \sin x - e^{-y}}{2(\cos x - \cosh y)}$ and $f(\pi/2) = 0$.

(6 marks)

(b) Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. Hence find the image of $|z| < 1$.

(6 marks)

Or

12. (a) Prove that the function $f(z)$ defined by $f(z) = \frac{x^3(1+i) - y^3 1 - i}{x^2 + y^2}$, $z \neq 0$ and $f(0) = 0$ is continuous and the Cauchy-Riemann equations are satisfied at the origin, yet $f'(0)$ does not exist.

(6 marks)

(b) Show that the transformation $w = \frac{3-z}{z-2}$ transforms the circle with center $\left(\frac{5}{2}, 0\right)$ and radius $\frac{1}{2}$ in the z-plane into the imaginary axis in the w-plane and the interior of the circle into the right half of the plane.

(6 marks)

13. (a) Evaluate $\int_C \frac{z-3}{z^2+2z+5}\,dz$, where C is the circle (i) $|z| = 1$; (ii) $|z+1-i| = 2$; (iii) $|z+1+i| = 2$.

(8 marks)

(b) Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and the residue at each pole.

(4 marks)

Or

14. (a) Find the Laurent's expansion of $f(z) = \frac{7z-2}{(z+1)\,z\,(z-2)}$ in the region $1 < |z+1| < 3$. (5 marks)

(b) Show the method of residues, that $\int_0^{\pi} \frac{a}{a^2 + \sin^2\theta}\, d\theta = \frac{\pi}{\sqrt{1+a^2}}$. (7 marks)

15. (a) Using Newton's iterative method, find the real root of $x \log_{10} x = 1.2$ correct to five decimal places.

(6 marks)

(b) Solve by Gauss-Seidel method :

$10x + 2y + z = 9$

$2x + 20y - 2z = -44$

$-2x + 3y + 10z = 22.$

(6 marks)

Or

16. (a) Find a real root of the equation $x^3 - x - 11 = 0$, correct to 4 decimal places using the bisection method.

(6 marks)

(b) Find the root of the equation $\cos x - xe^x = 0$ by secant method correct to four decimal places.

(6 marks)

17. Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = yz + x$, $\frac{dz}{dx} = xz + y$ given that $y(0) = 1$, $z(0) = -1$ for $y(0.2)$, $z(0.2)$.

Or

18. Apply Milne's method, to find a solution of the differential equation $y' = x - y^2$ in the range $0 \le x \le 1$ for the boundary condition $y = 0$ at $x = 0$.

19. (a) What is the maximization transport problem ? How do you solve it ? (3 marks)

(b) Using simplex method solve the LPP

Maximize $z = 5x_1 + 3x_2$

subject to $x_1 + x_2 \le 2$

$5x_1 + 2x_2 \le 10$

$3x_1 + 8x_2 \le 12,$

$x_1, x_2 \ge 0.$

(9 marks)

Or

20. Find the initial basic feasible solution of the following transportation problem by Vogel's approximation method (VAM). Here, F_1, F_2 and F_3 are factories, and W_1, W_2 and W_3 are warehouses.

	W_1	W_2	W_3	W_4	*Production of Factories*
F_1	21	16	25	13	11
F_2	17	18	14	23	13
F_3	32	27	18	41	19
Capacity of the warehouse	6	10	12	15	43

(5 × 12 = 60 marks)

F 3622 (Pages : 4) Reg. No.................................

Name....................................

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Computer Science and Engineering/Information Technology

EN 010 501-B—ENGINEERING MATHEMATICS—IV (CS, IT)

(Regular/Improvement/Supplementary)

[New Scheme—2010 Admission onwards)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 marks.

1. Evaluate $\Delta(\sin 2x \cos 4x)$.
2. Find the Z-transform of $a^n \cos n\theta$.
3. Let a be a numeric function such that $a_r = \begin{cases} 2, & 0 \le r \le 3 \\ 2^{-r}+5, & r \ge 4 \end{cases}$. Determine Δa and ∇a.
4. Evaluate $\int_0^{1+i} (x^2 - iy)\, dz$ along the path $y = x^2$.
5. Explain the arrival pattern of customers.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 marks.

6. Using Newton's divided difference formula, Evaluate $f(8)$ and $f(15)$ given :

x :	4	5	7	10	11	13
y :	48	100	294	900	1210	2028

7. Use convolution theorem to find the inverse Z-transform of $\dfrac{8z^2}{(2z-1)(4z+1)}$.
8. Find the particular solution of the difference equation $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2$.
9. If $f(\xi) = \int_C \dfrac{3z^2+7z+1}{z-\xi}\, dz$, where C is the circle $|z| = 2$, find the values of $f(3)$, $f'(1-i)$ and $f''(1-i)$.
10. State and explain Little's formula. What are its applications ?

(5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.
Each full question carries 12 marks.

11. (a) Using Newton's forward interpolation formula, find y at $x = 8$ from the following table :—

x :	0	5	10	15	20	25
y :	7	11	14	18	24	32

(6 marks)

(b) Evaluate $\int_0^4 e^x \, dx$ by Simpson's rule, given that $e = 2.72$, $e^2 = 7.39$, $e^3 = 20.09$. $e^4 = 54.6$ and compare it with the actual value.

(6 marks)

Or

12. (a) From the following table, calculate $\frac{dy}{dx}, \frac{d^2y}{dx^2}$ and $\frac{d^3y}{dx^3}$ at $x = 1.5$

x :	1.5	2.0	2.5	3.0	3.5	4.0
y :	3.375	7.0	13.625	24.0	38.875	59.0

(6 marks)

(b) Apply (i) Trapezoidal rule ; and (ii) Simpson's $\frac{1}{3}$ rule, to find an approximate value of $\int_{-3}^{3} x^4 \, dx$ by taking six equal subintervals. Compare it with the exact value.

(6 marks)

13. (a) Find $Z^{-1}\left(\frac{4z}{z-1^3}\right)$ by the long division method. (6 marks)

(b) Solve $y_{n+1} + 4y_{n+1} + 3y_n = 3^n$ with $y_0 = 0, y_1 = 1$. (6 marks)

Or

14. (a) Find the inverse Z-transform of $\frac{2(z^2 - 5z + 6.5)}{(z-2)(z-3)^2}$ for $2 < |z| < 3$. (6 marks)

(b) Solve $y_{n+2} - 2y_{n+1} + y_n = 3n + 5$. (6 marks)

15. (a) Determine the generating function of the numeric function a_r,

where $a_r = \begin{cases} 2^r, & \text{if } r \text{ is even} \\ 2^{-r}, & \text{if } r \text{ is odd} \end{cases}$

(6 marks)

(b) Solve the difference equation $a_r - 5a_{r-1} + 6a_{r-2} = 2^r + r$. (6 marks)

Or

16. (a) Determine the discrete numeric function corresponding to the generating function $A(z) = (1+z)^n + (1-z)^n$.

(6 marks)

(b) Determine the particular solution for the difference equation $a_r - 3a_{r-1} + 2a_{r-2} = 2^r$.

(6 marks)

17. (a) Expand $\frac{1}{z^2 - 3z + 2}$ in the region (i) $|z| < 1$; (ii) $1 < |z| < 2$; (iii) $|z| > 2$; (iv) $0 < |z - 1| < 1$.

(9 marks)

(b) Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2 (z+2)}$ and the residue at each pole.

(3 marks)

Or

18. (a) Evaluate by contour integration $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)} dx$.

(9 marks)

(b) Expand the function $\frac{1}{z+1}$, about $z = 1$ in Taylor's series.

(3 marks)

19. (a) In a supermarket, the average arrival rate of customers is 10/hr. The average time taken at the bill and cash desk is 4.5 min. This time is exponentially distributed :

(i) How long will be customer expect to wait for service at the cash desk ?

(ii) What is the chance that the queue length will exceed 5 ?

(iii) What is the probability that the cashier is working ?

(7 marks)

(b) Explain the different service disciplines in the case of a queuing system.

(5 marks)

Or

20. (a) In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the servicetime distribution is also exponential with an average 36 minutes. Calculate the following :—

(i) The mean queue size.

(ii) The probability thats the queue size exceeds 10.

(iii) If the input of trains increases to an average 33 per day, what will be the change in (i) and (ii).

(7 marks)

Turn over

(b) A T.V. repairmen finds that the time spent on his job has an exponential/distribution with mean 30 minutes. If the repaired set arrive on an average of 10 per 8-hour day with Poisson :

(i) What is the repairmen's idle time each day ?

(ii) What is the average queue length ?

(iii) Find average number of jobs in the system.

(5 marks)

[5 × 12 = 60 marks]

F 3622 (Pages : 4) Reg. No.................................

Name..................................

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Computer Science and Engineering/Information Technology

EN 010 501-B—ENGINEERING MATHEMATICS—IV (CS, IT)

(Regular/Improvement/Supplementary)

[New Scheme—2010 Admission onwards)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 marks.

1. Evaluate Δ (sin $2x$ cos $4x$).
2. Find the Z-transform of $a^n \cos n\theta$.
3. Let a be a numeric function such that $a_r = \begin{cases} 2, & 0 \le r \le 3 \\ 2^{-r} + 5, & r \ge 4 \end{cases}$. Determine $\Delta\, a$ and $\nabla\, a$.
4. Evaluate $\int_0^{1+i} (x^2 - iy)\, dz$ along the path $y = x^2$.
5. Explain the arrival pattern of customers.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 marks.

6. Using Newton's divided difference formula, Evaluate $f(8)$ and $f(15)$ given :

x :	4	5	7	10	11	13
y :	48	100	294	900	1210	2028

7. Use convolution theorem to find the inverse Z-transform of $\frac{8z^2}{(2z-1)(4z+1)}$.
8. Find the particular solution of the difference equation $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2$.
9. If $f(\xi) = \int_C \frac{3z^2 + 7z + 1}{z - \xi}\, dz$, where C is the circle $|z| = 2$, find the values of $f(3)$, $f'(1-i)$ and $f''(1-i)$.
10. State and explain Little's formula. What are its applications ?

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 marks.

11. (a) Using Newton's forward interpolation formula, find y at $x = 8$ from the following table :—

x :	0	5	10	15	20	25
y :	7	11	14	18	24	32

(6 marks)

(b) Evaluate $\int_0^4 e^x\, dx$ by Simpson's rule, given that $e = 2.72$, $e^2 = 7.39$, $e^3 = 20.09$. $e^4 = 54.6$ and compare it with the actual value.

(6 marks)

Or

12. (a) From the following table, calculate $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$ and $\frac{d^3y}{dx^3}$ at $x = 1.5$

x :	1.5	2.0	2.5	3.0	3.5	4.0
y :	3.375	7.0	13.625	24.0	38.875	59.0

(6 marks)

(b) Apply (i) Trapezoidal rule ; and (ii) Simpson's $\frac{1}{3}$ rule, to find an approximate value of $\int_{-3}^{3} x^4\, dx$ by taking six equal subintervals. Compare it with the exact value.

(6 marks)

13. (a) Find $Z^{-1}\left(\frac{4z}{z-1^3}\right)$ by the long division method. (6 marks)

(b) Solve $y_{n+1} + 4y_{n+1} + 3y_n = 3^n$ with $y_0 = 0, y_1 = 1$. (6 marks)

Or

14. (a) Find the inverse Z-transform of $\frac{2\left(z^2 - 5z + 6.5\right)}{(z-2)(z-3)^2}$ for $2 < |z| < 3$. (6 marks)

(b) Solve $y_{n+2} - 2y_{n+1} + y_n = 3n + 5$. (6 marks)

15. (a) Determine the generating function of the numeric function a_r,

where $a_r = \begin{cases} 2^r, & \text{if } r \text{ is even} \\ 2^{-r}, & \text{if } r \text{ is odd} \end{cases}$

(6 marks)

(b) Solve the difference equation $a_r - 5a_{r-1} + 6a_{r-2} = 2^r + r$. (6 marks)

Or

16. (a) Determine the discrete numeric function corresponding to the generating function $A(z) = (1+z)^n + (1-z)^n$.

(6 marks)

(b) Determine the particular solution for the difference equation $a_r - 3a_{r-1} + 2a_{r-2} = 2^r$.

(6 marks)

17. (a) Expand $\frac{1}{z^2 - 3z + 2}$ in the region (i) $|z| < 1$; (ii) $1 < |z| < 2$; (iii) $|z| > 2$; (iv) $0 < |z-1| < 1$.

(9 marks)

(b) Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2 (z+2)}$ and the residue at each pole.

(3 marks)

Or

18. (a) Evaluate by contour integration $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)} dx$.

(9 marks)

(b) Expand the function $\frac{1}{z+1}$, about $z = 1$ in Taylor's series.

(3 marks)

19. (a) In a supermarket, the average arrival rate of customers is 10/hr. The average time taken at the bill and cash desk is 4.5 min. This time is exponentially distributed :

(i) How long will be customer expect to wait for service at the cash desk ?

(ii) What is the chance that the queue length will exceed 5 ?

(iii) What is the probability that the cashier is working ?

(7 marks)

(b) Explain the different service disciplines in the case of a queuing system.

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Or

20. (a) In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the servicetime distribution is also exponential with an average 36 minutes. Calculate the following :—

(i) The mean queue size.

(ii) The probability thats the queue size exceeds 10.

(iii) If the input of trains increases to an average 33 per day, what will be the change in (i) and (ii).

(7 marks)

Turn over

(b) A T.V. repairmen finds that the time spent on his job has an exponential/distribution with mean 30 minutes. If the repaired set arrive on an average of 10 per 8-hour day with Poisson :

(i) What is the repairmen's idle time each day ?

(ii) What is the average queue length ?

(iii) Find average number of jobs in the system.

(5 marks)

[5 × 12 = 60 marks]

F 3164 **(Pages : 3)** **Reg. No................................**

Name...................................

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Common to all Branches except C.S. and I.T.

ENGINEERING MATHEMATICS – IV (CMELPASUF)

(Old Scheme—Supplementary/Mercy Chance)

[Prior to 2010 admissions]

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*
Each full question carries 20 *marks.*

1\. (a) Using Cauchy's integral formula, evaluate $\int_C \frac{z+1}{z^2+2z+5}\,dz$ where C is the circle $|z+1-i|=2$, integration being taken in the counter clockwise direction.

(b) Expand $\frac{1}{z(z-1)(z-2)}$ in Laurent's series for $|z|>2$.

Or

2\. (a) Evaluate $\oint_C \frac{z}{z(z-1)(z-2)^2}\,dz$, where C is the circle $|z-2|=\frac{1}{2}$.

(b) Evaluate by contour integration $\int_0^\infty \frac{x^2dx}{\left(x^2+9\right)\left(x^2+4\right)^2}$.

3\. (a) Find a root of the equation $x^6-x^4-x^3=1$ correct to three decimal places using Regula Falsi method.

(b) Solve by Gauss-Jacobi's method :

$$54x+y+z=110$$
$$2x+15y+6z=72$$
$$-x+6y+27z=85.$$

Or

Turn over

4. (a) Find a root of $x^3 - 4x - 9 = 0$ correct to three decimal places using Bisection method.

   (b) Solve by Gauss-Seidel method :

$$10x_1 - 5x_2 - 2x_3 = 3$$
$$4x_1 - 10x_2 + 3x_3 = -3$$
$$x_1 + 6x_2 + 10x_3 = -3.$$

5. (a) Using Taylor's series method solve $\frac{dy}{dx} = x^2 - y, y(0) = 1$ at x = 0.1, 0.2, 0.3 and 0.4.

   (b) Use Runge-Kutta method to solve $\frac{dy}{dx} = x^2 - y^2, y(1) = 1.5$ at x = 1.2 in steps of 0.1.

Or

6. (a) Taking h = 0.05 and applying modified Euler's method, solve the initial value problem $y' = x^2 + y, y(0) = 1$, obtain y (0.1).

   (b) Using Milne's predictor-corrector method solve the initial value problem $2\frac{dy}{dx} = (1 + x^2)y^2, y(0) = 1$ and obtain y (0.4). Use the solution values :

$y(0.1) = 1.06, y(0.2) = 1.12, y(0.3) = 1.21.$

7. (a) Given $Z(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}, |z| > 3$, show that $u_1 = 2, u_2 = 21, u_3 = 139$.

   (b) Solve $x_{n+1} - y_n = 1, y_{n+1} - x_n = 0, x_0 = 0, y_0 = -1$.

Or

8. (a) Find the z-transform of :

   (i) $e^{4t} \sin 3t$.

   (ii) $(t + T)e^{-(t+T)}$.

   (iii) $4^n + \left(\frac{1}{2}\right)^n + u(n-3)$.

   (b) Find the inverse z-transform of $\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$.

9. (a) Solve the following L.P.P. by simplex method :

Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$

subject to
$$x_1 + 2x_2 + 3x_3 = 15$$
$$2x_1 + x_2 + 5x_3 = 20$$
$$x_1 + 2x_2 + x_3 + x_4 = 10.$$

(b) Solve the following transportation problem :

		Destination				Avail
		D_1	D_2	D_3	D_4	
	O_1	5	3	6	2	19
Origin	O_2	4	7	9	1	37
	O_3	3	4	7	5	34
Require		16	18	31	25	

Or

10. (a) Using the duality theory, solve the L.P.P. :

Minimize $Z = 3x_1 - 2x_2 + 4x_3$

subject to
$$3x_1 + 5x_2 + 4x_3 \geq 7$$
$$6x_1 + x_2 + 3x_3 \geq 4$$
$$7x_1 - 2x_2 - x_3 \leq 10$$
$$x_1, x_2, x_3 \geq 0.$$

(b) Apply Vogel's method to find the transportation cost to the following transportation model :

	1	2	3	4	
1	10	2	20	11	15
2	12	7	9	20	25
3	4	14	16	18	10
	5	15	15	15	

(5 × 20 = 100 marks)

F 3164 **(Pages : 3)** **Reg. No.................................**

Name.....................................

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Common to all Branches except C.S. and I.T.

ENGINEERING MATHEMATICS – IV (CMELPASUF)

(Old Scheme—Supplementary/Mercy Chance)

[Prior to 2010 admissions]

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*
Each full question carries 20 *marks.*

1. (a) Using Cauchy's integral formula, evaluate $\int_C \frac{z+1}{z^2+2z+5}\,dz$ where C is the circle $|z+1-i|=2$, integration being taken in the counter clockwise direction.

   (b) Expand $\frac{1}{z(z-1)(z-2)}$ in Laurent's series for $|z|>2$.

Or

2. (a) Evaluate $\oint_C \frac{z}{z(z-1)(z-2)^2}\,dz$, where C is the circle $|z-2|=\frac{1}{2}$.

   (b) Evaluate by contour integration $\int_0^\infty \frac{x^2dx}{\left(x^2+9\right)\left(x^2+4\right)^2}$.

3. (a) Find a root of the equation $x^6-x^4-x^3=1$ correct to three decimal places using Regula Falsi method.

   (b) Solve by Gauss-Jacobi's method :

$$\begin{aligned}54x+y+z &= 110\\ 2x+15y+6z &= 72\\ -x+6y+27z &= 85.\end{aligned}$$

Or

Turn over

4. (a) Find a root of $x^3 - 4x - 9 = 0$ correct to three decimal places using Bisection method.

(b) Solve by Gauss-Seidel method :

$$10x_1 - 5x_2 - 2x_3 = 3$$
$$4x_1 - 10x_2 + 3x_3 = -3$$
$$x_1 + 6x_2 + 10x_3 = -3.$$

5. (a) Using Taylor's series method solve $\frac{dy}{dx} = x^2 - y, y(0) = 1$ at $x = 0.1, 0.2, 0.3$ and 0.4.

(b) Use Runge-Kutta method to solve $\frac{dy}{dx} = x^2 - y^2, y(1) = 1.5$ at $x = 1.2$ in steps of 0.1.

Or

6. (a) Taking $h = 0.05$ and applying modified Euler's method, solve the initial value problem $y' = x^2 + y, y(0) = 1$, obtain y (0.1).

(b) Using Milne's predictor-corrector method solve the initial value problem $\frac{2dy}{dx} = \left(1 + x^2\right)y^2, y(0) = 1$ and obtain y (0.4). Use the solution values :

$y(0.1) = 1.06, y(0.2) = 1.12, y(0.3) = 1.21.$

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(5 × 20 = 100 marks)