F 6405 (Pages : 2) Reg. No................................

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

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Fifth Semester

Branch : Electrical and Electronics Engineering

COMMUNICATION ENGINEERING (E)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 marks.

1. Write the expression for FM signal for a sinusoidal modulating signal and define modulation index.
2. Draw the spectrum of AM signal having carrier signal $A_c(t) = 10 \sin (2\pi \times 10^8 t)$ and modulating signal $A_m (t) = 5 \sin (2\pi \times 10^4 t)$.
3. What are the advantages of superheterodyne receivers over tuned radio frequency (TRF) receivers ?
4. Draw the circuit diagram of FM modulator.
5. What is pre-equalizing and post-equalizing pulses in the vertical synchronization pulse train of a composite video signal ?
6. What are the requirements to be full filled by the composite colour television signal to achieve full compatibility ?
7. What are the different types of display units used in RADAR systems ?
8. What is the use of delay line canceler in MTI RADAR ?
9. What are the disadvantages of geosynchronous satellites ?
10. Explain the DA-FDMA system used in satellite communication.

(10 × 4 = 40 marks)

Part B

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

11. Draw the spectrum of the amplitude modulated signal having carrier signal $A_c(t) = 10 \sin (2\pi \times 10^8 t)$ and modulating signal $A_m (t) = 3 \sin (2000 \pi t) + 4 \sin (1500 \pi t)$. Also, determine the modulation index, sideband power and bandwidth of the modulated signal.

Or

Turn over

12. Derive the expressions for frequency modulated signal using sinusoidal modulation. Express the spectrum of the above signal and comment on its bandwidth.

13. With neat block diagram, explain the working of FM receiver.

Or

14. (a) Define image frequency in an AM receiver. How the image frequency rejection is achieved ?
    (b) What is intermediate frequency (IF) in an AM receiver ?
    (c) Why automatic gain control (AGC) is employed in radio receivers.

(3 × 4 = 12 marks)

15. Explain the need for vertical synchronization pulse in the composite video signal and describe the components of the vertical synchronization pulse.

Or

16. (a) Describe the specifications of any one television standard. (6 marks)
    (b) Define luminance, hue and saturation of a colour signal. (6 marks)

17. Explain how a moving target is identified using RADAR. How the velocity of a moving target is determined ?

Or

18. (a) Describe the working of an instrument landing system (ILS). (8 marks)
    (b) Write down RADAR range equation and define the terms used in it. (4 marks)

19. Derive Equivalent Isotropic Radiated Power (EIRP) equations for satellite up-link and down-link.

Or

20. Discuss any two multiple access technique used for satellites.

[5 × 12 = 60 marks]

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B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

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)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 marks.

1. State the necessary and sufficient conditions for a function to be analytic. Write one example for an analytic function.

2. Evaluate $\int_0^{2+i} (\bar{z})^2\, dz$, , along the line $2y = x$.

3. Find a root of $x = \cos x$ using Bisection method.

4. Solve $y' = 3x^2 + y$ in $0 \le x \le 1$ by Euler's method taking $h = 0.1$, given $y(0) = 4$.

5. State the theorem on complementary slackness conditions.

(5 × 3 = 15 marks)

Part B

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

6. Under the transformation $w = z^2$, obtain the map in the w-plane of the square with vertices $(0,0), (2,0), (2,2), (0,2)$ in the z-plane.

7. Expand $\dfrac{z^2 - 1}{(z+2)(z+3)}$, for $|z| > 3$ in Laurent's series.

8. Find a root of the equation $x^6 - x^4 - x^3 - 1 = 0$ correct to three decimal places using Regula-Falsi method.

Turn over

9. Solve $\frac{dy}{dx} = z - x$, $\frac{dz}{dx} = y + x$ with $y(0) = 1$, $z(0) = 1$ to get $y(0.1)$ and $z(0.1)$, using Taylor's method.

10. Maximize $z = 3x_1 + 2x_2$
subject to $3x_1 + 4x_2 \le 12$
$2x_1 + 5x_2 \le 10$
$x_1, x_2 \ge 0$.

(5 × 5 = 25 marks)

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) Show that the polar form of Cauchy-Riemann equations are $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}, \frac{\partial v}{\partial r} = -\frac{1}{r}\frac{\partial u}{\partial \theta}$ and hence deduce $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r}\frac{\partial u}{\partial r} + \frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2} = 0$.

(6 marks)

(b) Show that the map of the circle $|z| = 2$ under the transformation $w + 2i = z + \frac{1}{z}$ is an ellipse, and find its axes and centre.

(6 marks)

Or

12. (a) Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic. Find a function V such that $f(z) = u + iv$ is analytic. Also express $f(z)$ in terms of z.

(7 marks)

(b) Find the image of the circle $|z| = 2$ under the transformation $w = z + 3 + 2i$.

(5 marks)

Module 2

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

(5 marks)

(b) Evaluate by contour integration :

$$\int_{-\infty}^{\infty} \frac{\sin x}{x^2 + 4x + 5} dx.$$

(7 marks)

Or

14. (a) Using Cauchy's integral formula, evaluate $\int_c \frac{e^z}{(z+1)^4 (z-2)} dz$, where c is $|z-1| = 3$.

(6 marks)

(b) Evaluate $\int_0^\infty \frac{dx}{x^4+1}$ by contour integration. (6 marks)

Module 3

15. (a) By using Gauss-Seidel iteration method, solve the following system of equations :

$$10x - 2y - z - u = 3$$
$$-2x + 10y - z - u = 15$$
$$-x - y - 10z - 2u = 27$$
$$-x - y - 2z + 10u = -9.$$

Carry out 2 iterations.

(7 marks)

(b) Find a root of $3x - 1 = \cos x$, correct to three decimals using Newton-Raphson's method.

(5 marks)

Or

16. (a) Find a root of $x^3 - 5x - 11 = 0$ correct to three decimals using iteration method. (5 marks)

(b) Find the root that lies between 0 and 1 for the equation $x^3 - 5x + 1 = 0$, using the bisection method. Carry out 4 iteractions.

(7 marks)

Module 4

17. Using 4th order Runge-Kutta method with step length $h = 0.2$, solve the initial value problem $y' = xy$, $y(1) = 2$, and obtain $y(1.2)$.

(12 marks)

Or

18. With the usual assumptions, derive Milne's predictor and corrector formulas of order 4 to solve the initial value problem :

$y' = f(x, y)$, $y(x_0) = y_0$.

(12 marks)

Module 5

19. Use dual simplex method to solve the L.P.P :

Minimize $z = 2x_1 + 3x_2 + 10x_3$

subject to $2x_1 - 5x_2 + 4x_3 \geq 30$

$3x_1 + 2x_2 - 5x_3 \geq 25$

$x_1 + 3x_2 + x_3 \leq 30$

$x_1, x_2, x_3 \geq 0.$

(12 marks)

Or

20. There are three factories F_1, F_2 and F_3 situated in different areas with supply capacities as 200, 400 and 350 units respectively. The items are shipped to five markets M_1, M_2, M_3, M_4 and M_5 with demands as 150, 120, 230,200, 250 units respectively. The cost matrix is given as follows :

	M_1	M_2	M_3	M_4	M_5
F_1	2	5	6	4	7
F_2	4	3	5	8	8
F_3	4	6	2	1	5

Determine the optimal shipping cost and shipping patterns.

(12 marks)

[5 × 12 = 60 marks]

	A	B	C	Supply
F	16	20	12	200
G	14	8	18	160
H	26	24	16	90
Demand	180	120	150	450

(10 marks)

[5 × 20 = 100 marks]

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

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Fifth Semester

Branch : Common to all branches except Computer Science and Engineering/ Information Technology

ENGINEERING MATHEMATICS–IV (CMELPASUF)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Answer any **one** *question from each module.*
All questions carry equal marks.

Module I

1. (a) State Cauchy's integral formula and integral theorem. Use it to evaluate $\int_C \frac{\cos \pi z}{z^2-1}$ where C is the rectangle with vertices $2 \pm i, -2 \pm i$.

(12 marks)

(b) Find the Laurent's series expansion of $\frac{1}{z-z^3}$ in $1<|z+1|<2$. (8 marks)

Or

2. (a) If $f(a)=\int_C \frac{4z^2+z+5}{z-a}\,dz$ where C is the ellipse $9x^2+4y^2=36$ find $f(3), f'(1)$ and $f''(-1)$.

(10 marks)

(b) Find the Taylor's series expansion of $f(z)=\frac{2z^3+1}{z^2+1}$ at $z=i$ and $z=-i$. (10 marks)

Module II

3. (a) Using method of false position, find a root of the equation $x^3-x-4=0$ lying between 1 and 2 correct to four decimal places.

(10 marks)

(b) Find by Newton's method, the root of the equation $\log x = \cos x$. (10 marks)

Or

Turn over

4. (a) Apply Gauss-Seidel method to solve the equations :

$$10x - 2y + z = 12,$$
$$x + 9y - z = 10,$$
$$2x - y + 11z = 20.$$

(12 marks)

(b) Find a root of the equation $x^3 - x = 11$ which lies between 2 and 3, using bisection method.

(8 marks)

Module III

5. (a) Use Taylor's series method to find $y(0.1)$ and $y(0.3)$ correct to four decimal places, given that $\frac{dy}{dx} = y^2 - x,\ y(0) = 1.$

(10 marks)

(b) Using Milne's Predictor-Corrector method find $y(1.2)$ taking $h = 0.1$, given $\frac{dy}{dx} = xy - x^2,\ y(1) = 1.$

(10 marks)

Or

6. (a) Use Euler's modified method to compute $y(0.4)$, given that $\frac{dy}{dx} = x^2 + y^2,\ y(0) = 3$ taking $h = 0.2$. correct to four decimal places.

(10 marks)

(b) Apply Runge-Kutta method order four to find an approximate value of y at $x = 0.1$ if $\frac{dy}{dx} = xy + y^2$ and $y(0) = 1.$

(10 marks)

Module IV

7. (a) Prove Shifting rules and hence show that $Z\left(\frac{1}{n!}\right) = e^{\frac{1}{z}}$. (8 marks)

(b) Using Z-transform solve $6y_{n+2} - y_{n+1} - y_n = 0$ with $y(0) = y(1) = 1$. (12 marks)

Or

8. (a) Solve $u_{n+2} - 2u_{n+1} + u_n = 2^n$ with $u_0 = 2, u_1 = 1$. (12 marks)

(b) Find $Z^{-1}\left[\frac{2z}{(z-1)(z^2+1)}\right]$. (8 marks)

Module V

9. (a) Using graphical method solve the following L.P.P.

Minimize $Z = 3x + 2y$

subject to the constraints,

$5x + y \geq 10,$

$x + y \geq 6,$

$x + 4y \geq 12$ with

$x, y \geq 0.$

(8 marks)

(b) How will you identify unbounded solution of an L.P.P. from its simplex table ? Using simplex algorithm, solve the following L.P.P.

Maximize $Z = 3x + 2y + 5z$

subject to the constraints,

$x + 2y + z \leq 430,$

$3x + 2z \leq 460,$

$x + 4z \leq 420$ with

$x, y, z \geq 0.$

(12 marks)

Or

10. (a) Use Big-M method to solve the following L.P.P. :

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

subject to the constraints,

$x_1 + 2x_2 + 3x_3 = 15,$

$2x_1 + x_2 + 5x_3 = 20,$

$x_1 + 2x_2 + x_3 + x_4 = 10$ with

$x_1, x_2, x_3, x_4 \geq 0.$

(10 marks)

(b) The following table gives the cost matrix of transporting one unit of a product from the sources F, G and H to the destinations A, B and C. Compute the optimum allocations and minimum cost of transportation using MODI method.

Turn over