Hall Ticket Number :										

Code: 4GC41

R-14

II B.Tech. II Semester Regular Examinations May 2016

Mathematics – III

(Common to EEE & ECE)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Evaluate $\int_0^1 x^3\sqrt{1-x}\ dx$ using Γ - functions. 7M

   b) If $\tan(x+iy)=u+iv$ then show that $u^2+v^2-2v\coth 2y+1=0$. 7M

OR

2. a) Evaluate $\int_0^{\frac{\pi}{2}} \sin^5\theta\ \cos^{\frac{7}{2}}\theta\ d\theta$. 7M

   b) Find the general and principal values of $\log(1+i\sqrt{3})$. 7M

UNIT–II

3. a) Apply C-R conditions to $f(z)=z^2$ and show that the function is analytic everywhere. 4M

   b) If $f(z)=u+iv$ is analytic function of z and if $u-v=(x-y)(x^2+4xy+y^2)$, find $f(z)$ in terms of z. 10M

OR

4. Suppose $f(z)=u+iv$ is an analytic function.

   (i) Show that u and v satisfy Laplace's equation.

   (ii) If $u=x^2+y^2$, find harmonic conjugate $v(x,y)$ and write the corresponding complex potential $f(z)=u+iv$. 14M

UNIT–III

5. a) Evaluate $\int_C \frac{dz}{(z-1)(z-3)}$ where c is $|z|=2$ using Cauchy's integral formula 7M

   b) Expand the function $f(z)=\frac{z}{z+2}$ in a Taylor series with center $z_0=1$ then find its radius of convergence. 7M

OR

6. a) Evaluate $\int_c \frac{z-2}{z}\,dz$ where c is the semi-circle $z=2e^{i\theta}$ with $0<\theta<\pi$ 4M

   b) Find the Laurent's series expansion of $f(z)=\frac{1}{(z+1)(z+3)}$ for $1<|z|<3$ and hence, evaluate $\int_C f(z)\,dz$, where $C:|z|=1.5$. 10M

UNIT–IV

7. a) Determine the poles of the function $f(z)=\frac{1-2z}{z(z-1)}$ and find the residue at each pole. 6M

   b) Evaluate the real integral $I=\int_{-\infty}^{\infty}\frac{1}{1+x^2}dx$ by the method of residue theorem. 8M

OR

8. a) State and Prove Argument principle. 7M

   b) Show that one root of the equation $z^4+z+1=0$ lies in the first quadrant. 7M

UNIT–V

9. Consider the points $0,\infty,i$ in z-plane is mapped onto the points $\infty,0,-i$ in w- plane under a bilinear transformation $f(z)$.

   (i) Determine the bilinear transformation $f(z)$.

   (ii) Find the image of $|z|<1$ under $f(z)$.

   (iii) Find the Invariant points of $f(z)$. 14M

OR

10. a) Find the bilinear transformation which maps $z=1,i,-1$ onto the point $w=i,0,-i$. 7M

    b) Show that the image of the circle $\left|z-\frac{1}{2}\right|=\frac{1}{2}$ in Z-plane is the vertical line $u=1$ in W-plane under the bilinear transformation $w=\frac{1}{z}$. 7M

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Hall Ticket Number :										

Code: 4G245

R-14

II B.Tech. II Semester Regular Examinations May 2016

Electrical Technology

(Electronics & Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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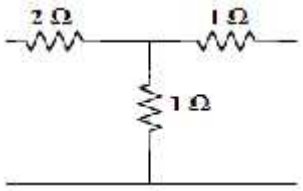
UNIT–I

1. a) Obtain z- parameters for the given network



7M

b) Derive Y-Parameters in terms of individual Y-Parameters of two two-port networks when they are parallel connected 7M

OR

2. a) Obtain the Y-Parameters of a passive network whose Admittances are Y_A,Y_B and Y_C, where Y_c appears in series branch 7M

b) Find ABCD parameters for cascade network 7M

UNIT–II

3. a) Derive the expression for current after t=0, in a RLC parallel circuit when it is switched to an ac source at t=0 seconds, which has $v(t)=V_m \sin(wt+\theta)$ 7M

b) A series RC circuit of R=15Ω and C=0.2F is supplied with a constant voltage of 15V at t=0, obtain the current expression in time domain 7M

OR

4. a) Define the time constant of R-L circuit. Give its Significance 7M

b) An uncharged 80μF capacitor is connected in series with a 1kΩ resistor and switch across a 110V supply. Determine the time constant of the circuit and the initial value of current flowing. Determine also the value of current flowing after (**i**) 40ms and (**ii**) 80ms. 7M

UNIT–III

5. a) Design T-type attenuator to provide the attenuation of 15dB. Taking characteristic impedance 200Ω. 7M

b) Derive the expression for cutoff frequency in case of constant K low pass filter 7M

OR

6. a) Design a low pass filter(both T and π sections) having a cutoff frequency of 2KHz to operate with a terminated load resistance of 500Ω 7M

b) Write a short note on Band pass filter 7M

UNIT–IV

7. a) Derive the expression for torque developed by the DC motor 7M

   b) A 440V DC shunt motor takes a no load current of 2.5A. The resistance of the shunt field and armature are 550Ω and 1.2Ω respectively. The full- load line current is 32A. Find the full- load output and the efficiency of the motor. 7M

OR

8. a) Explain the operation of a 4 point starter with neat sketch 7M

   b) A 4 pole, lap wound, DC generator has 42 coils with 8 turns per coil. It is driven at 1120r.p.m. If the useful flux per pole is 21m Wb. Calculate the Generated EMF. Find the speed at which it is to be driven to generate the same EMF as calculated above , with wave wound armature 7M

UNIT–V

9. a) A 1-Φ transformer has 180 turns and 360 turns respectively in its primary and secondary windings. The respective resistances are 0.233Ω and 0.067Ω. Calculate the (**i**) secondary resistance referred to primary (**ii**) primary resistance referred to secondary (**iii**) Total resistance of the transformer referred to primary 7M

   b) Derive the EMF Equation of a transformer and Explain the working principle of a transformer 7M

OR

10. a) Explain the principle of operation of stepper motor and draw its characteristics 7M

    b) Explain the shaded pole motor with neat sketch 7M

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Hall Ticket Number :										

Code: 4G341

R-14

II B.Tech. II Semester Regular Examinations May 2016

Random Variables and Random Processes

(Electronics & Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) State and prove the properties of Distribution and Density functions. 7M

   b) In a box there are 500 colored balls: 75 black, 150 green, 175 red, 70 white, and 30 blue. What are the probabilities of selecting a ball of each colour. 7M

OR

2. a) State and Prove bayes' Theorem. 7M

   b) Explain Conditional Distribution and Density Functions. 7M

UNIT–II

3. a) A random X is uniformly distributed on the interval (-5, 15). Another random variable Y= $e^{-x/5}$ is formed. Find E[Y]. 7M

   b) Define moment generating function and mention its properties. 7M

OR

4. a) Explain the concept of transformation of random variable X. 7M

   b) A discrete random variable X has possible values x_n,=n, n=1,2,3 which occur with probabilities $p(x_n)=(0.5)^n$ Find E[X] and VAR(X). 7M

UNIT–III

5. a) Explain the properties of Joint Distribution and Density Functions. 7M

   b) Explain joint central moments and joint characteristic functions. 7M

OR

6. a) Given the function $f(x,y) = \begin{cases} & \text{for } x^2+y^2 < b \\ 0 & \text{else where} \end{cases}$ 8M

   (i) Find the constant 'b' so that this is a valid joint density function.

   (ii) Find $P(0.5 < x_2 + y_2 < 0.8b)$ 9M

   b) Briefly explain the concept of statistical independence. 5M

UNIT–IV

7. a) Explain the concept of Wide Sense Stationary random processes. 7M

   b) What is mean ergodic and correlation ergodic random processes. Explain? 7M

OR

8. a) Given two random processes X(t) and Y(t). find the expressions for auto correlation functions of W(t)= X(t)+Y(t) if

   i) X(t) and Y(t) are correlated

   ii) They are uncorrelated.

   iii) They are uncorrelated with zero means 7M

   b) Briefly explain the Time averages and Ergodicity of random processes. 7M

UNIT–V

9. a) Consider a random processes X(t)= A cos(ω_0t+φ) where A and ω_0 are real constants and φ is a random variable uniformly distributed over the interval (0,π/2). Find the average power in X(t). 9M

   b) List out the properties of cross power density spectrum. 5M

OR

10. a) Briefly explain the Bandwidth of power density spectrum. 7M

    b) Derive the relationship between power spectrum and auto correlation function. 7M

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Hall Ticket Number :										

Code: 4G342

R-14

II B.Tech. II Semester Regular Examinations May 2016

Switching Theory and Logic Design

(Electronics & Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) (i) Convert the following number

$(2468)_{10} = (\quad)_{16}$ 3M

(ii) Determine the value of x for the following number

$(292)_{10} = (1204)_x$ 3M

b) Briefly explain the significance of error detection and correction codes in digital communication. Is parity bit is an error detection and correction code? Explain how Hamming code detects a single bit error and corrects it with a suitable example. 8M

OR

2. a) Algebraically prove the following equations, identify the postulates or theorems of Boolean algebra used?

(**i**) ab + a'b = b (**ii**) a' + ab + a' + b (**iii**) ab + a'c + bc = ab + a'c

(**iv**) (ab)' = a' + b' 7M

b) Implement the following functions using NAND gates

(i) $Y_1 = A(B + \overline{CD}) + \overline{BC}$

(ii) $Y_2 = wx + \bar{x}y\,(z + \bar{w})$ 7M

UNIT–II

3. a) Convert the given expression in standard POS form

$F_1(A,B,C,D) = (A+B)(B+C)(A+C)$

$F_2(P,Q,R) = (P+\bar{Q})(P+R)$ 7M

b) Realize the following expressions using NAND and NOR logic separately

Y = PQ' + QS + Q'RS' 7M

OR

4. Simplify the following Boolean expression using Quine Mc-Clusky tabulation method F(w,x,y,z) = Σ (0,1,2,5,7,8,9,10,13,15) 14M

UNIT–III

5. a) Design BCD to gray code converter and realize using logic gates. 9M

b) Design a 2 x 4 decoder using NAND gates. 5M

OR

6. a) Write short notes on PROM 8M

b) Compare PROM, PLA and PAL. 6M

UNIT–IV

7. a) With neat sketches explain the operation of JK flip-flop. What is the draw back in JK flip-flop? 7M

   b) Write short notes level mode and pulse mode asynchronous sequential circuits. 7M

OR

8 Design a mod-6 synchronous counter using JK flip-flops. 14M

UNIT–V

9. a) Distinguish between Mealy and Moore machines. 7M

   b) Explain the rules for converting Mealy to Moore model with an example. 7M

OR

10. a) What are the capabilities and limitations of an FSM 4M

    b) Draw a ASM chart for a 2-bit binary counter having one enable line E such that:
    E = 1(counting enabled)
    E = 0(counting disabled) 10M

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Hall Ticket Number :										

R-14

Code: 4G343

II B.Tech. II Semester Regular Examinations May 2016

Analog Communications

(Electronics & Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) A broadcast AM transmitter radiates 50KW of carrier power. What will be the radiated power at 80% modulation? 7M

   b) Draw the block diagram and explain the generation of SSB-SC wave using phase shift methods. 7M

OR

2. a) Consider the AM signal S_{AM} (t) = [A_c + m(t)]COS 5000t, where the modulating signal is given by m(t) = 3 cos 50 t + 5 cos 150 t. Let the modulation index be 0.8. Find i) The amplitude of the carrier ii) carrier power & iii) transmission efficiency. 8M

   b) What is the necessity of synchronous Carrier in the coherent detection of a Suppressed carrier signal? Explain in detail, with the necessary mathematical treatment. 6M

UNIT–II

3. a) Explain how varactor diode is used to generate FM signal. Explain with necessary mathematical equations. 8M

   b) Describe the usefulness of Carson's rule as applicable to FM Systems. 6M

OR

4. a) Draw the circuit for Ratio detector and explain how it is derived from Foster-Seely discriminator. 8M

   b) Compute the Bandwidth required for transmission of FM signal having frequency deviation of 75 KHz and audio bandwidth of 10 KHz. 6M

UNIT–III

5. a) Explain the noise performance of SSB- SC receiver and prove its S/N ratio is unity. 8M

   b) Explain the concept of pre-emphasis & de-emphasis and mention its necessity. 6M

OR

6. a) Derive the Noise figure in Frequency modulation. 8M

   b) Explain threshold effect in Angle modulation. 6M

UNIT–IV

7. a) Draw the block diagram of AM transmitter using low level modulation and explain the significance of each block. 8M

   b) What is an Amplitude Limiter? Explain its operation with a neat circuit Diagram. 6M

OR

8. a) Explain the classification of Radio Transmitters. 6M

   b) The RF frequency, local oscillator frequency and IF frequencies of an AM receiver are $f_s = 800$ $f_l = 1255$KHz and I.F = 455KHz respectively

      i. Determine image frequency.

      ii. Image frequency rejection ratio for a loaded Q of 120. 8M

UNIT–V

9 a) Explain the generation and detection of PPM signals with neat diagram. 8M

   b) Compare FDM and TDM schemes. 6M

OR

10 a) Explain the generation and demodulation of a PAM signal with neat circuit diagram. 8M

   b) Explain the generation and demodulation of a PWM signal. 8M

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Hall Ticket Number :										

Code: 4G344

R-14

II B.Tech. II Semester Regular Examinations May 2016

Field Theory and Transmission Lines

(Electronics & Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Derive the electric flux density for a line charge using coulomb's law? 8M

   b) Determine the divergence of these vector fields:

   $(i)\ P = x^2yz\,a_x + xz\,a_z$

   $(ii)\ Q = \rho \sin\phi\ a_\rho + \rho^2 z\,a_\phi + z\cos\phi\,a_z$

   $(iii)\ T = \frac{1}{r^2}\cos\theta\ a_r + r\sin\theta\cos\phi\ a_\theta + \cos\theta\,a_\phi$ 6M

OR

2. a) State Gauss's law and obtain point form of first Maxwell's equation? 8M

   b) Given the potential $V = \left(\frac{1}{r^2}\right)\sin\theta\cos\phi$ find (i) D at (2, π/2, 0) and (ii) Calculate work done in moving a 10μC charge from A (1, 30^0, 120^0) to B (4,90^0, 60^0)? 6M

UNIT–II

3. a) Discuss convection and conduction currents, hence derive point form of ohms law? 8M

   b) If $J = \frac{2}{r^3}(2\cos\theta a_r + \sin\theta a_\theta)\ A/m^2$, Calculate the current passing through (i) A hemispherical shell of radius 20 cm (ii) A spherical shell of radius 10 cm 6M

OR

4. a) Derive expressions for continuity of current and relaxation time? 8M

   b) The resistance of a round long wire of diameter 3 mm is 4.0 Ω/km. If a current of 40 A flows through the wire, find

   (**i**) The conductivity of the wire.

   (**ii**) The electric current density in the wire. 6M

UNIT–III

5. a) State and derive Biot-Savart's law? Is Magnetostatic field conservative discuss, hence obtain M.E for divergence of magnetic field? 10M

   b) A current element of length 2 cm is located at the origin in free space and carries current 12mA along a_z, a filamentary current of 15 a_z, is located along x=3, y=4. Find the force on a current filament? 4M

OR

6. a) What is magnetic energy? Derive energy stored in Magnetostatic field? 8M

   b) Given the magnetic vector potential $A = (\rho^2/4)a_z$ wb/m^2 ? Calculate the total magnetic flux crossing the surface $\Phi=\pi/2$, 1<ρ<2m, 0<z<5m? 6M

UNIT–IV

7. a) State and Derive Poynting Theorem, hence obtain expression for time average power crossing a surface. 10M

   b) The average power crossing a surface in free space region given by $E = \frac{H_0}{\rho}\cos(10^6 t + \beta z)a_\phi V/m$ and $H = \frac{H_0}{\rho}\cos(10^6 t + \beta z)a_\rho A/m$ respectively. Determine H_0 and β such that given fields satisfy Maxwell's equations? 4M

OR

8. a) Derive and obtain the relation between reflection coefficient and transmission coefficient due to reflection of plane waves at oblique incidence when E and H fields are polarized in parallel? 10M

   b) An EM wave travels in free space with electric field component $Es = 100e^{j(0.866y+0.5z)}ax\ V/m$. Determine (i) ω and (ii) λ 4M

UNIT–V

9 a) Derive and Obtain the expressions for propagation constant and Characteristic Impedance for Lossless transmission line? 6M

   b) A 100+j150Ω load is connected to a 75Ω lossless line.
   Find (**i**) Reflection coefficient (**ii**) VSWR (**iii**) Load admittance
   (**iv**) Input impedance from the load using smith chart? 8M

OR

10. a) Explain how quarter wave transformer is used for load matching and impedance measurement of a transmission line? 8M

    b) An open wire transmission line having characteristic impedance 600Ω is terminated by a resistive load of 900Ω. Design single stub matched transmission line. 6M

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