| Hall Ticket Number : | | | | | | | | | | |
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**R-19**

**Code: 19A243T**

II B.Tech. II Semester Supplementary Examinations May/June 2024

# Generation and Transmission of Electric Power

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks )

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| | | Marks | CO | BL |
|---|---|---|---|---|
| | **UNIT–I** | | | |
| 1. | Explain the working of steam power station with diagram. What are the important constituents of a steam power station? | 14M | CO1 | L2 |
| | **OR** | | | |
| 2. | What are the factors which affect the location of site of a hydro electric power plant | 14M | CO1 | L1 |
| | **UNIT–II** | | | |
| 3. | Derive an expression for the capacitance per unit length of a 3-phase line completely transposed. What is the effect of earth on the capacitance of the line? | 14M | CO2 | L3 |
| | **OR** | | | |
| 4. | Discuss the concept of geometric mean distance. How is this concept use to find the inductance of composite conductor line. | 14M | CO2 | L2 |
| | **UNIT–III** | | | |
| 5. | Draw phasor diagrams for a nominal Pi circuit and nominal T circuit of transmission line. Derive expressions for sending end voltage and current in each case. | 14M | CO3 | L2 |
| | **OR** | | | |
| 6. | Obtain A, B, C, D constants for a short transmission line. | 14M | CO3 | L2 |
| | **UNIT–IV** | | | |
| 7. | A string of eight suspension insulators is to be fitted with a grading ring. If the pin to earth capacitances are all equal to C, find the values of line to pin capacitances that would give a uniform voltage distribution over the string. | 14M | CO4 | L3 |
| | **OR** | | | |
| 8. | Explain Ferranti effect and proximity effect. | 14M | CO4 | L2 |
| | **UNIT–V** | | | |
| 9. | A single core cable for use on 11 kV, 50 Hz system has conductor area of 0·645 $cm^2$ and internal diameter of sheath is 2·18 cm. The permittivity of the dielectric used in the cable is 3·5. Find (i) the maximum electrostatic stress in the cable (ii) minimum electrostatic stress in the cable (iii) capacitance of the cable per km length (iv) charging current. | 14M | CO5 | L3 |
| | **OR** | | | |
| 10. | Describe with a neat sketch the construction of a 3-core belted type cable. Discuss the limitations of such a cable. | 14M | CO5 | L2 |

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| Hall Ticket Number : | | | | | | | | | | |
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**R-19**

**Code: 19A244T**

II B.Tech. II Semester Supplementary Examinations May/June 2024

# Linear Control Systems

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks )

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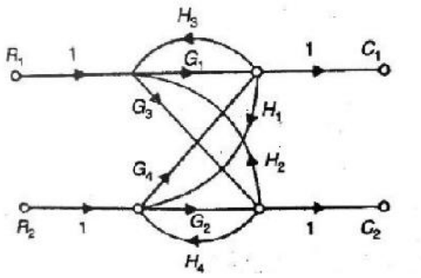
| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | Deduce the output C1 in the given signal flow graph using Mason's gain formula   | 8M | 1 | 2 |
| | b) | Derive the transfer function of armature-controlled dc motor | 6M | 1 | 2 |
| | | **OR** | | | |
| 2. | a) | Derive an expression for the transfer function of an armature controlled DC servo motor. | 9M | 1 | 2 |
| | b) | Distinguish open loop and closed loop control system | 5M | 1 | 2 |
| | | **UNIT–II** | | | |
| 3. | a) | Determine the underdamped response of second order control system subjected to unit step input function | 8M | 2 | 2 |
| | b) | Obtain the rise time , peak time, maximum peak overshoot and settling time of the unit step response of a closed loop control system given by $G(s) = 36/(s^2+2s+36)$ | 6M | 2 | 2 |
| | | **OR** | | | |
| 4. | | Explain static error constants and generalized error coefficients | 14M | 2 | 1 |
| | | **UNIT–III** | | | |
| 5. | | The characteristic equation of a servo system is given by a0s 4+a1s 3+a2s 2+a3s+a4=0. Determine the conditions which must be satisfied by the coefficients in the characteristic equations for the system to be stable | 14M | 3 | 2 |
| | | **OR** | | | |
| 6. | | Given $G(s) = K/S(S+1)(S+3)$. Sketch the root locus plot and comment on the stability. Also determine the range of K for which the system is stable and the frequency of sustained oscillations. | 14M | 3 | 2 |
| | | **UNIT–IV** | | | |
| 7. | | The open loop transfer function of the unity feedback system is $G(s) = K/S(S+2)(S+10)$ By using Nyquist plot a. Find the range of k for stability b. Find the value of k for gain margin be 10 dB c. Find the value of k for phase margin to be 50° | 14M | 3 | 2 |
| | | **OR** | | | |
| 8. | | Explain bode plots of basic factors of a transfer function. | 14M | 3 | 1 |
| | | **UNIT–V** | | | |
| 9. | | The open loop transfer function of a unity feedback system is $G(s) = K_v/S(S+2)$ Design a suitable lead compensator to meet the following specification : Kv=12S-1 , $\varphi_{pm}$=45° | 14M | 4 | 2 |
| | | **OR** | | | |
| 10. | | Derive the transfer function of Lag, Lead and Lag-Lead compensator using electrical network | 14M | 4 | 2 |

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| Hall Ticket Number : | | | | | | | | | | |
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**R-19**

**Code: 19A245T**

II B.Tech. II Semester Supplementary Examinations May/June 2024

# Network Analysis and Synthesis

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks )

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| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | Develop the relationship for 'Y' parameters in terms of 'h' parameters | 7M | CO1 | L6 |
| | b) | Determine the h-parameters with the following data:<br>i) With output terminals shorted<br>V1=25V, I1=1A, I2=2A<br>ii) With output terminals opened<br>V1=10V, V2=50V, I2=2A | 7M | CO1 | L3 |
| | | **OR** | | | |
| 2. | a) | Explain the Z-parameters of the Two-Port Network. | 7M | CO1 | L2 |
| | b) | Explain the Y-parameters of the Two-Port Network. | 7M | CO1 | L2 |
| | | **UNIT–II** | | | |
| 3. | a) | List out the advantages of Laplace transform approach. | 7M | CO2 | L1 |
| | b) | Determine the inverse Laplace transform of the following functions.<br>i) $H(S) = \frac{(S+1)}{S(S+2)}$ (ii) $F(S) = \frac{S^2}{(S^2+1)^2}$ | 7M | CO2 | L3 |
| | | **OR** | | | |
| 4. | a) | Determine the Laplace transform of the following<br>(i) $f(t) = t\sin 2t$ (ii) $f(t) = 3t^4 - e^{-t} + 4e^{-3t}\cos 5t - 2e^{-4t}\sinh 3t$ | 7M | CO2 | L3 |
| | b) | Determine the Laplace transform of the non-periodic square wave of amplitude 'A' and time period of 'T'sec. | 7M | CO2 | L3 |
| | | **UNIT–III** | | | |
| 5. | | Determine the current i(t) for t>0 in a series RLC circuit having Vs=100V, R=10Ω, L=0.5H and C=1μF using classical differential equation solvation approach. | 14M | CO3 | L3 |
| | | **OR** | | | |
| 6. | a) | Explain the importance of Initial Conditions. | 10M | CO3 | L2 |
| | b) | Define the time constant of RL and RC series circuit. | 4M | CO3 | L1 |
| | | **UNIT–IV** | | | |
| 7. | | In a two-element series network, voltage v(t) is applied, which is given as v(t) = 50 + 50 sin5000t + 30 sin10000t, the resultant current is given as i(t) = 11.2 sin(5000t+63.4°) + 10.6 sin(10000t+45°). Determine the network elements and the power dissipated in the circuit. | 14M | CO4 | L3 |
| | | **OR** | | | |
| 8. | | Explain all symmetry properties such as even function, odd function and halfwave symmetry of the waveform with examples. | 14M | CO4 | L2 |
| | | **UNIT–V** | | | |
| 9. | a) | Determine the Foster form-I realization for the function<br>$Z(s) = \frac{3(s+1)(s+4)}{(s+3)(s+5)}$ | 7M | CO5 | L3 |
| | b) | List out the necessary conditions for a driving point function? | 7M | CO5 | L1 |
| | | **OR** | | | |
| 10. | a) | Determine the Cauer form-II realization for the function<br>$F(s) = \frac{2(s+1)(s+3)}{s(s+2)}$ | 7M | CO5 | L3 |
| | b) | List out the necessary conditions for a Transfer function? | 7M | CO5 | L1 |

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| Hall Ticket Number : | | | | | | | | | | |
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**R-19**

**Code: 19AC42T**

II B.Tech. II Semester Supplementary Examinations May / June 2024

# Numerical Methods and Transform Techniques

(Common to EEE & ECE)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks )

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| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | Find the real root of $x^3 - 2x - 9 = 0$ using Newton Raphson Method | 7M | CO1 | L3 |
| | b) | Find the cubic polynomial which takes the following values | | | |

| x | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| Y | 1 | 2 | 1 | 10 |

7M CO1 L1

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 2. | a) | Find the real root of $3x = \cos x + 1$ using Newton Raphson Method | 7M | CO1 | L3 |
| | b) | Calculate the value of f(7.5) from the following data | | | |

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| f(x) | 1 | 8 | 27 | 64 | 125 | 216 | 343 | 512 |

7M CO1 L3

**UNIT–II**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3. | a) | Compute $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x=1 from the following data. | | | | | | |

| x | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| y | 1 | 8 | 27 | 64 | 125 | 216 |

7M CO2 L3

b) Solve $\frac{dy}{dx} = x + y^2$, $y(1) = 0$ to find y at x=0.2 by Runge-Kutta method of fourth order. 7M CO2 L3

**OR**

4. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at i)x=1.1 ii)x=1.6

| x | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
|---|---|---|---|---|---|---|---|
| y | 7.989 | 8.403 | 8.781 | 9.129 | 9.451 | 9.750 | 10.031 |

14M CO2 L1

**UNIT–III**

5. Expand $f(z) = \frac{1+2z}{z^2 + z^3}$ in a series of +ve and –ve powers of z 14M CO3 L2

**OR**

6. Obtain the Taylor's series expansion of $f(z) = \frac{e^z}{z(z+1)}$ about z=2 14M CO3 L3

**UNIT–IV**

7. Find the finite fourier sine and cosine transform of $f(x)=\begin{cases}1, 0<x<\frac{®}{2}\\ -1, \frac{®}{2}<x<®\end{cases}$ 14M CO4 L1

**OR**

8. Solve the integral equation $\int_0^{\infty} f(\bar{}) \cos \sim \bar{} d\bar{} = \begin{cases}1-\sim, 0 \le \sim \le 1\\ 0, \sim > 1\end{cases}$ and hence evaluate $\int_0^{\infty} \frac{\sin^2 t}{t^2} dt$ 14M CO4 L3

**UNIT–V**

9. Show that $Z\left(\frac{1}{n!}\right) = e^{\frac{1}{z}}$ and hence evaluate $Z\left(\frac{1}{(n+1)!}\right)$ and $Z\left(\frac{1}{(n+2)!}\right)$ 14M CO5 L2

**OR**

10. Find $Z^{-1}\left(\frac{4z^2-2z}{z^3-5z^2+8z-4}\right)$ 14M CO5 L1

***END***

| Hall Ticket Number : | | | | | | | | | | | R-19 |
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**Code: 19A242T**

II B.Tech. II Semester Supplementary Examinations May / June 2024

# Electromagnetic Fields

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks )

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| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | Three equal point charges $10^{-4}$ C each are located at the corner of a square side 4m. Determine the magnitude and direction of force at the vacant corner having the charge of 4 µC. | 8M | CO1 | L3 |
| | b) | State and explain the gauss law in an electrostatic field. | 6M | CO1 | L2 |
| | | **OR** | | | |
| 2. | a) | Evaluate the work done in a moving a point charge q from a to b along radial path centered at line charge density ρ C/m. | 8M | CO1 | L3 |
| | b) | List out any two applications of gauss's law. | 6M | CO1 | L1 |
| | | **UNIT–II** | | | |
| 3. | a) | Show that the Torque on a physical dipole $\overline{p}$ in a uniform electric field $\overline{E}$ is given by $\overline{p} \times \overline{E}$ | 8M | CO1 | L3 |
| | b) | Evaluate the torque for a dipole consisting of 5µC in an electric field E=5000 ($Z\,a_x - a_y - a_z$) separated by 5mm located on Z axis at origin. | 6M | CO1 | L3 |
| | | **OR** | | | |
| 4. | a) | Derive the expression for the capacitance of co-axial cable. | 8M | CO2 | L3 |
| | b) | The radius of two spheres differs by 5cm and capacity of the spherical condenser is 45pF.If the outer sphere is earthed, calculate radius assuming air as dielectric. | 6M | CO2 | L3 |
| | | **UNIT–III** | | | |
| 5. | a) | State and explain ampere's circuital law. | 6M | CO3 | L2 |
| | b) | Derive the expression for magnetic field intensity of an Infinite sheet of current Using ampere's circuital law. | 8M | CO3 | L3 |
| | | **OR** | | | |
| 6. | a) | Derive the expression for vector magnetic potential from Biot-Savarts's law. | 8M | CO3 | L3 |
| | b) | Given the magnetic vector potential A= $\frac{-\rho^2}{4} az\ Wb/m$. Determine the total magnetic flux crossing the surface φ=π/2, $1 \leq z \leq 5\ m$ | 6M | CO3 | L3 |
| | | **UNIT–IV** | | | |
| 7. | a) | Two long parallel wires in air 5m apart carrying current $I_1$ and $I_2$ in the same direction the field intensity H at mid away is 7.5AT/m. if the force on each wire per unit length is 0.35mN. determine values of $I_1$ and $I_2$ | 10M | CO3 | L4 |
| | b) | Show that force experienced by the current carrying element is placed in uniform magnetic field is zero. | 4M | CO4 | L2 |
| | | **OR** | | | |
| 8. | | Derive an expression for torque on a current carrying loop placed in a magnetic field. | 14M | CO3 | L3 |
| | | **UNIT–V** | | | |
| 9. | a) | Differentiate motional induced EMF and statically induced EMF | 7M | CO5 | L1 |
| | b) | Derive the integral form of time varying Maxwell equation from ampere's circuital law. | 7M | CO5 | L3 |
| | | **OR** | | | |
| 10. | | Explain Faraday's laws of Electromagnetic Induction and Derive the expression for static induced emf and dynamic induced emf. | 14M | CO5 | L2 |

***END***

| Hall Ticket Number : | | | | | | | | | | |
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**R-19**

**Code: 19A241T**

II B.Tech. II Semester Supplementary Examinations May/June 2024

# Electrical Machines-II

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks )

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| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | Prove that maximum torque developed by the 3-Ph induction motor does not depend on the rotor circuit resistance? | 7M | 2 | 2 |
| | b) | A 3-phase induction motor runs at 1440 rpm at full load when supplied power from 50 Hz, 3-phase line. Calculate:<br>(i) The number of poles. (ii) Slip of full load.<br>(iii) Speed of the rotor field w.r.t rotor. (iv) Speed of the rotor field w.r.t stator. | 7M | 1 | 3 |
| | | **OR** | | | |
| 2. | | Classify and explain various types of armature windings of synchronous machine with its advantages. | 14M | 1 | 2 |
| | | **UNIT–II** | | | |
| 3. | | A cage induction motor when started by means of a star-delta starter takes 190% of full load line current and develops 40% of full load torque at starting. Determine the starting torque and current in terms of full load values, if an auto transformer with 80% tapping were employed. | 14M | 3 | 3 |
| | | **OR** | | | |
| 4. | a) | Explain the working principle of Induction generator. | 7M | 2 | 1 |
| | b) | Explain the conducting procedure of Blocked rotor test on three phase induction motor. | 7M | 1 | 2 |
| | | **UNIT–III** | | | |
| 5. | | Explain the construction and working of Split Phase and Capacitor Start-Run Induction motor. Mentions its applications. | 14M | 2 | 2 |
| | | **OR** | | | |
| 6. | | The following test results are obtained in case of a 4 pole, 50Hz, 220V, 1-Ph IM:<br>No load : 220V 5.8A 310W<br>Blocked rotor : 120V 13.8A 530W<br>Stator winding resistance = 1.4Ω; The full load speed of the motor is 1440rpm. Determine the equivalent circuit of the motor. | 14M | 4 | 2 |
| | | **UNIT–IV** | | | |
| 7. | a) | Explain the effect of load power factor on armature reaction of 3-ph alternator. | 8M | 5 | 2 |
| | b) | A 3 ph y connected, 1000KVA, 11KV alternator has rated current of 52.5A. The ac resistance of the winding is 0.45 Ω/ph. The test results are given as<br>OC test: $I_f$ = 12.5A, voltage between lines = 422V<br>SC test: $I_f$ = 12.5A, line current = 52.5A<br>Compute the synchronous reactance per phase. | 6M | 5 | 3 |
| | | **OR** | | | |
| 8. | a) | Compare the salient features of projecting pole rotor and round rotor. | 8M | 1 | 1 |
| | b) | Find the pitch factor for the winding of 36 slots, 4 poles, coil span 1 to 8. | 6M | 1 | 2 |
| | | **UNIT–V** | | | |
| 9. | a) | Describe how the synchronous motor can operate as synchronous condenser | 7M | 6 | 2 |
| | b) | A 400V, 50Hz, 33.7KW, 3 ph star connected SM has a full load efficiency of 88%. The synchronous impedance of motor is (0.2 +j1.6) Ω/ph. If the motor excitation is adjusted to give a leading p.f of 0.9. Calculate line induced e.m.f. | 7M | 4 | 3 |
| | | **OR** | | | |
| 10. | a) | Discuss the need for connecting the alternators in parallel. Mention the conditions for parallel operation of alternators. | 7M | 5 | 2 |
| | b) | What is an infinite bus? Mention the conditions to be satisfied prior to synchronizing an alternator to infinite bus bar. | 7M | 6 | 1 |

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