Hall Ticket Number :										

R-17

Code: 7G241

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

AC Machines-I

(Electrical and Electronics 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) Explain the constructional features of a single phase transformer with neat sketch. 7M

   b) The emf per turn for a single phase, 2310/220 V, 50 Hz, transformer is approximately 13 volts. Calculate (i) the number of primary and secondary turns and (ii) the net cross sectional area of the core, for a maximum flux density of 1.4T. 7M

OR

2. a) Explain the performance of transformer on no load condition with neat diagram. 7M

   b) Classify transformer losses and examine the effect of frequency and supply voltage on core losses. 7M

UNIT–II

3. a) Illustrate the exact equivalent circuit of a transformer and describe briefly on various parameters involved in it. 7M

   b) A 240V/120V, 12 kVA transformer has full load unity power factor efficiency of 96.2%. It is connected as an auto-transformer to feed a load at 360 V. Determine its rating and full-load efficiency at 0.85 power factor lagging. 7M

OR

4. a) Outline the purpose of Sumpner's test and explain how it is conducted on two identical single phase transformers. 7M

   b) Define efficiency of a transformer and obtain the condition for maximum efficiency a transformer. 7M

UNIT–III

5. Describe about four possible connections of three phase transformers with relevant relations amongst voltages and currents on both h.v. and l.v. sides. 14M

OR

6. a) Outline the necessity for parallel operation of transformers and describe the necessary conditions for parallel operation. 7M

   b) Explain open Δ connection of transformer with necessary diagram. Also, point out its advantages and disadvantages. 7M

UNIT–IV

7. a) Derive an expression for the torque of an induction motor and obtain the condition for maximum torque. 7M

   b) A three phase, 6 pole, 50 Hz induction motor has a slip of 1% at no load and 3% at full load. Determine
   i) Synchronous speed
   ii) No load speed and full load speed
   iii) Frequency of rotor current at standstill
   iv) Frequency of rotor current at full load. 7M

OR

8. a) Explain the constructional feature and principle of operation of three phase induction motor. 7M

   b) Describe briefly on crawling and cogging of three phase induction motor with an illustration. 7M

UNIT–V

9. A 15 kW, 400 V, 4-pole, 50 Hz, 3-phase star connected induction motor gave the following test results:

	No-load test	Blocked rotor test
Line voltage	400 V	200 V
Line current	9 A	50 A
Power input	1310 watts	7100 watts

Stator and rotor ohmic losses at standstill are assumed equal.

Plot the induction motor circle diagram and determine

i) line current, power factor, slip, torque and efficiency at full load

ii) maximum power output and maximum power input

iii) slip at which maximum torque occurs

iv) maximum torque and starting torque 14M

OR

10. Explain the different methods of speed control of a three phase induction motor. 14M

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Hall Ticket Number :										

R-17

Code: 7G345

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

Analog Electronics-II

(Electrical and Electronics 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) What is an IC chip size and Circuit complexity and Explain in detail? 7M
   b) Explain in detail the Basic Information of Op-amp with relevant expressions. 7M

OR

2. a) Describe the Ideal op-amp and explain each block in detail 7M
   b) A Differential amplifier as a common mode gain Ac= 0.1 and difference mode gain Ad= 200. Let the input signal be V1=1050 µV and V2= 950 µV. Compute the output voltage and CMMR 7M

UNIT–II

3. a) Draw the block diagram of operational amplifier and explain its each block with examples. 10M
   b) A sine wave o peak value 6mvolt and 2 KHz frequency is applied to an op-amp integrator. R1=100KΩ Cf=1µf. what is the output voltage? 4M

OR

4. a) Explain the operation of a inverting and non-inverting Op-amp amplifier with examples. 10M
   b) Examine the output of Op-amp integrator circuit for an applied unit step input signal. 4M

UNIT–III

5. a) Derive an expression for a subtractor. Subtractor is also called difference amplifier why? 4M
   b) Explain the working of Schmitt trigger circuit using Op-amp with necessary diagrams. 10M

OR

6. a) Explanation of different Applications of using Op-amp in detail. 6M
   b) Derive an expression for an inverting, summing op-amp by drawing neat circuits and assume all initial values as zero(Vb=0, Va=0). 8M

UNIT–IV

7. a) Identify the features of FSK demodulators. 4M
   b) Draw the functional diagram of Monostable and Astable operations using IC555 timer and explain in detail. 10M

OR

8. a) Explain the basic principle and List out the applications of PLL 10M
   b) Discuss about 565 PLL with one application. 4M

UNIT–V

9. a) Report the various specifications of DAC/ADC in detail. 4M
   b) Explain the working principle of R-2R Ladder DAC with a neat diagram. 10M

OR

10. a) Prepare the various applications of Dual slope ADC, in detail. 6M
    b) Explain the working principle of ADCs-parallel comparator with a neat diagram. 8M

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Hall Ticket Number :										

R-17

Code: 7GC43

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

Complex Variables and Special Functions

(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) Show that $(m,n)=\dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ 7M

   b) If cosh(u + iv) = x + iy, prove that

   (i) $\dfrac{x^2}{\cosh^2 u}+\dfrac{y^2}{\sinh^2 u}=1$ (ii) $\dfrac{x^2}{\cos^2 v}-\dfrac{y^2}{\sin^2 v}=1$ 7M

OR

2. a) Evaluate $\int_0^\infty e^{-ax}x^{m-1}\sin bx\,dx$ in terms of Gamma function. 7M

   b) Separate the real and imaginary parts of (i) $\sinh(x+iy)$ (ii) $\cosh(x+iy)$ 7M

UNIT–II

3. a) Prove that the function $f(z)$ defined by $f(z)=\dfrac{x^3(1+i)-y^3(1-i)}{x^2+y^2}(z\neq 0), f(0)=0$ is continuous and the Cauchy Riemann equations are satisfied at the origin, yet $f'(0)$ does not exist. 7M

   b) Find the conjugate harmonic of $v(r,\theta)=r^2\cos 2\theta - r\cos\theta + 2$. Show that v is harmonic. 7M

OR

4. a) Determine the analytic function

   $f(z)=u+iv$ if $u-v=\dfrac{\cos x+\sin x-e^{-y}}{2(\cos x-\cosh y)}$ and $f\left(\dfrac{\pi}{2}\right)=0$. 7M

   b) Derive Cauchy-Riemann equations in polar coordinates. 7M

UNIT–III

5. Find the Taylor's expansion of $f(z)=\dfrac{2z^3+1}{z^2+z}$ about the point $z=i$. 14M

OR

6. If $f(z)$ is analytic inside a circle C with centre at a, then for z inside C prove that

   $$f(z)=f(a)+f'(a)(z-a)+\frac{f''(a)}{2!}(z-a)^2+\text{-----}+\frac{f^n(a)}{n!}(z-a)^n+\text{----}$$ 14M

UNIT–IV

7. a) State and prove Residue theorem. 7M

b) Evaluate $\int_0^{\infty} \frac{\cos ax}{x^2+1} dx$. 7M

OR

8. a) Find the residue of $f(z) = \frac{z^2}{(z-1)^4 (z-2)(z-3)}$ at its poles and hence evaluate $\int_C f(z) dz$ where C is the circle $|z| = 2.5$. 7M

b) Show that $\int_0^{2\pi} \frac{\cos 2\theta}{1-2a\cos\theta + a^2} d\theta = \frac{2\pi a^2}{1-a^2}, (a^2 < 1)$ 7M

UNIT–V

9. Find the bilinear transformation which maps the points z = 1, i, -1 onto the points w = i, 0, -i. Hence find the image of $|z| < 1$, 14M

OR

10. Show that the transformation effected by an analytic function $w = f(z)$ is conformal at every point of the Z-plane where $f'(z) \neq 0$. 14M

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Hall Ticket Number :										

R-17

Code: 7G244

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

Electrical Circuits-II

(Electrical and Electronics 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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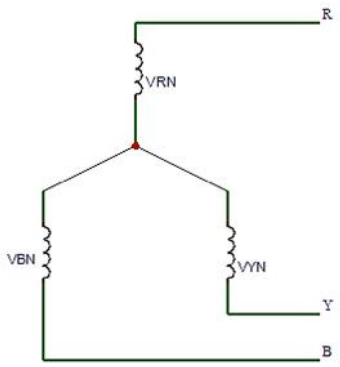
UNIT–I

1. a) A symmetrical star connected system has V_{RN} =230∠0□ The phase sequence is RYB. Find V_{RY}, V_{YB}, V_{BR}.



7M

b) The input power to a three-phase load is 10kW at 0.8 Pf. Two watt meters are connected to measure the power. Find the reading of higher reading wattmeter. 7M

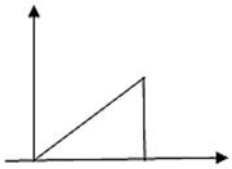
OR

2. a) The three impedances Z_1 = 20∠30□Ω, Z_2 = 40∠60□Ω, Z_3 = 10∠-90□Ω are delta-connected to a 400V, 3 – Ø system. Determine the phase and line currents. 7M

b) A single wattmeter is connected to measure reactive power of a three-phase, three-wire balanced load. The line current is 17A and line voltage is 440V. Calculate the power factor of the load if the reading of the wattmeter is 4488 VAR. 7M

UNIT–II

3. a) Find the function f (t) in terms of unit step function in the graph shown.



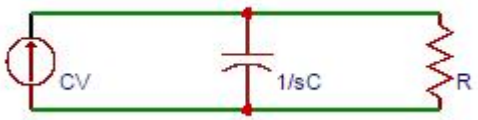
7M

b) If u (t) = 1 for t >= 0 and u (t) = 0 for t < 0, determine the Laplace transform of [u (t) – u (t – a)]. 7M

OR

4. a) Determine the inverse transform of F (s) = (s+5)/s(s^2+2s+5). 7M

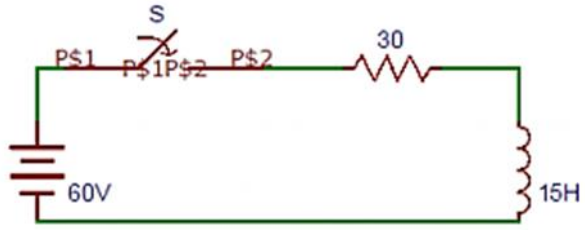
b) The voltage across the resistor in the parallel circuit shown is?



7M

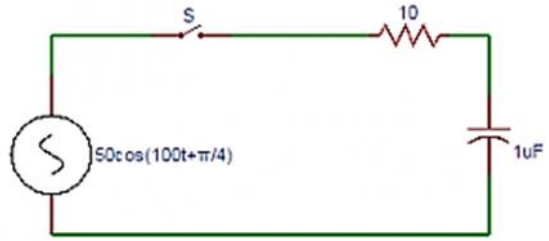
UNIT–III

5. a) A series R-L circuit with R=30Ω and L=15H has a constant voltage V = 60V applied at t = 0 as shown in the figure. Determine the current (A) in the circuit at t = 0+.



7M

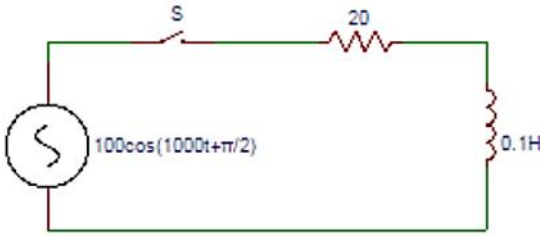
b) In the circuit shown below, the switch is closed at t = 0, applied voltage is v(t)=50cos (102t+π/4), resistance R = 10Ω and capacitance C = 1μF. The complementary function of the solution of 'i' is?



7M

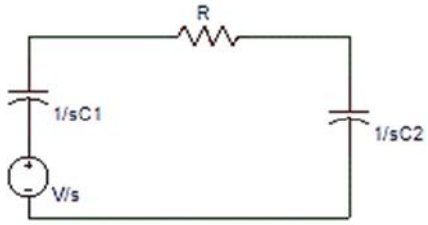
OR

6. a) In the circuit shown below, the switch is closed at t = 0, applied voltage is v(t)=100cos (103t+π/2), resistance R = 20Ω and inductance L = 0.1H. The complementary function of the solution of 'i' is?



7M

b) For the circuit shown below, find the voltage across the capacitor C_1 at the time the switch is closed.



7M

UNIT–IV

7. a) What is the Fourier cosine series of f(x) = π/ 4 – x/ 2 , where 0 <x<π 7M

b) The function f is defined by f(x) = e^x for −L<x <L. Find its Fourier series. 7M

OR

8. a) Compute the Fourier transform of the signal

$$x(t)=\sum_{k=-\infty}^{\infty} f(t+2k), where$$

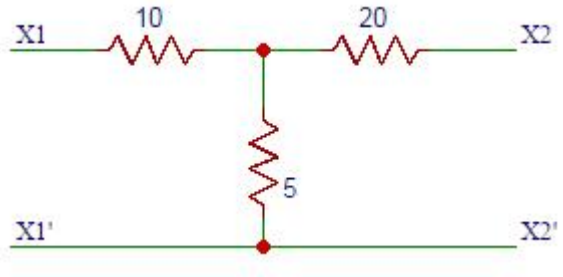
$$f(t)=\begin{cases} t+1, & for \quad -1\le t<0 \\ 1-t, & for \quad 0\le t<1 \\ 0, & else \end{cases}$$

7M

b) Compute the Fourier transform of the signal $x(t)=e^{-t}u(t)$. 7M

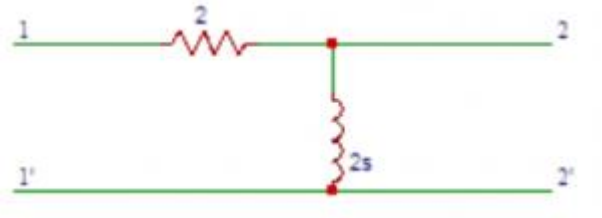
UNIT–V

9. a) In the circuit shown below, find the Z-parameter $Z_{11}, Z_{12}, Z_{21}, Z_{22}$.



7M

b) Obtain the transfer function G_{21} (S) in the circuit shown below.



7M

OR

10. a) Consider the impedance function Z(s)=3(s+2)(s+4)/(s+1)(s+3) . Find the value of R_1, R_2, C_1, C_2 and R_∞ after realizing by first Foster method. 7M

b) Consider the polynomial $P(s)=s^4+3s^2+2$. Check whether the given polynomial P (s) is Hurwitz or not. 7M

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Hall Ticket Number :										

R-17

Code: 7G242

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

Electromagnetic Fields

(Electrical and Electronics 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) Define Electric Filed Intensity and derive the expression for electric field intensity due to infinite line charge placed on Z-axis? 7M

   b) Define Gauss law and derive the expression for it? Verify the application of Gauss law for deriving the expression for EFI due to infinite surface charge? 7M

OR

2. a) Derive the expression for electric field intensity due to a differential volume element? 7M

   b) A charge of −0.3μC is located at A (25, -30, 15) cm and a second charge of 0.5μC is located at B (-10, 8, 12) cm. Find the electric field strength, E at
   i) The origin and ii) Point P (15, 20, 50) cm? 7M

UNIT–II

3. a) Derive an expression for capacitance of a parallel plate capacitor with two dielectric media? 7M

   b) Derive the boundary conditions between media having dielectric and conductor? 7M

OR

4. a) Derive an expression for the capacitance of a spherical capacitor consisting of two concentric spheres of radius ‘a’ & ‘b’? 7M

   b) Four 0.8 nC point charges are located in free space at the corners of a square 4cm on a side. (i)Find the total potential energy stored.(ii) A fifth 0.8 μC charge is installed at the center of the square. Again find the total energy stored? 7M

UNIT–III

5. a) Derive the expression for energy stored in magnetic field and energy density? 7M

   b) Derive Biot-Savart law and relate it to Amperes law. Show that the divergence magnetic induction is always zero? 7M

OR

6. a) List the similarities and differences between Coulomb’s and Biot-Savart law? 7M

   b) Find H in Cartesian components at P (2, 3, 4) if there is a current filament on the Z axis carrying 8 mA in the az direction. (i) Repeat if filament is located at x= -1, y= 2. (ii) Find H if both filaments are present? 7M

UNIT–IV

7. a) Derive the expression for force between two parallel current carrying conductors, if currents are in the same direction? 7M

   b) Derive an expression for a torque on a closed rectangular loop carrying current? 7M

OR

8. a) Derive the expression for energy density in a magnetic field? 7M

   b) Derive the expression for torque developed in a rectangular closed circuit carrying current I in a uniform field? 7M

UNIT–V

9. a) State and explain the Poynting theorem and derive the necessary equations? 7M

   b) Write the Maxwell’s equations in point and integral form for time varying fields? 7M

OR

10. a) State and explain the faraday’s laws in electromagnetic induction in integral form and pointing form? 7M

    b) State and Explain in statistically induced EMF and dynamically induced EMF? 7M

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Hall Ticket Number :										

R-17

Code: 7G243

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

Linear Control Systems

(Electrical and Electronics 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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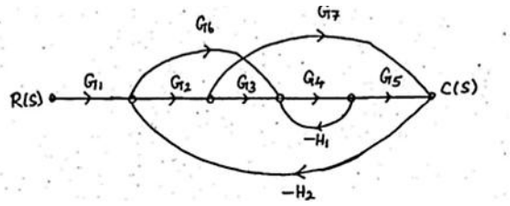
UNIT–I

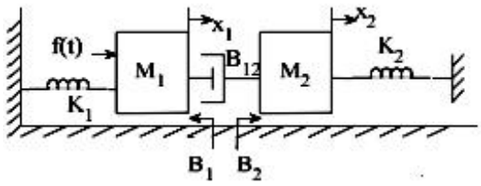
1. Deduce the block diagram of the given signal flow graph. Also find the transfer function using Mason's gain formula



14M

OR

2. For the mechanical system shown below, derive the transfer function. Also draw the force-voltage and force-current analogous circuits.



14M

UNIT–II

3. Obtain the response of an unity feedback system whose open loop transfer functions is $G(s) = \frac{4}{s(s+5)}$. The system is subjected to unit step input. Find the rise time, peak time, settling time and peak over shoot 14M

OR

4. Derive the response of under damped second order system with unit ramp input 14M

UNIT–III

5. a) By Routh stability criterion determine the stability of the system represented by characteristics equation $9s^5 - 20s^4 + 10s^3 - s^2 - 9s - 10 = 0$. Comment on the location of characteristic equation. 10M

   b) Define : Asymptotic stability; BIBO stability 4M

OR

6. A unity feedback system has an open loop transfer function $G(s) = \frac{K}{s(s^2+s+12)}$. Sketch the root locus and determine the dominant closed loop poles with $\zeta = 0.5$. Determine the value of K at this point. 14M

UNIT–IV

7. The open loop transfer function of a unity feedback system is given by $G(s) = \frac{1}{s(1+s)^2}$. Sketch the polar plot. Determine gain margin and phase margin 14M

OR

8. Derive the frequency domain specifications of a second order system 14M

UNIT–V

9. A unity feedback system has an open loop transfer function of $G(s) = \frac{k}{s(2s+1)}$. Design a suitable lag compensator so that the phase margin is 40^o and steady state error for ramp input is less than or equal to 0.2 14M

OR

10. a) Compute state transition matrix e^{At} where $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$ 7M

    b) Find the eigen values of the matrix given below: $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$ 7M

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