Hall Ticket Number :										

R-17

Code: 7G241

II B.Tech. II Semester Supplementary Examinations March 2021

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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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	What are the hysteresis and eddy current losses and how they are minimized?	7M	1	L2
	b)	A transformer with an output voltage of 4200 V is supplied at 230 V. If the secondary has 2000 turns, calculate the number of primary turns. Derive the formulae used.	7M	4	L4
		OR			
2.	a)	Explain the working principle and operation of a single phase transformer under no load and load conditions with phasor diagrams.	7M	1	L2
	b)	Explain the different types of transformers	7M	1	L2
		UNIT–II			
3.	a)	Derive the condition for maximum efficiency of a single phase transformer.	7M	2	L2
	b)	An open circuit test on a 50 kVA, 2400 V/240 V transformer gives 240 V, 5.41A and 186 W when the measurement were made on secondary side. The short circuit test results when measured on the primary side are 48 V, 20.8 A and 617 W. Calculate the efficiency and regulation at full load with a power factor of 0.8 lagging.	7M	4	L4
		OR			
4.	a)	Draw and derive the equivalent circuit parameters of a single phase transformer.	7M	2	L2
	b)	At 400 V and 50 Hz the core loss of a transformer was found to be 2400 W. When the transformer is supplied at 200 V and 25 Hz, the core loss is 800 W. Calculate the hysteresis and eddy current loss at 400 V and 50 Hz.	7M	4	L4
		UNIT–III			
5.		Explain with the help of connection and phasor diagram, how the Scott connections are used to obtain two-phase supply from 3 – phase supply mains.	14M	2	L4
		OR			
6.	a)	What is mean by parallel operation of transformers? Explain in detail	7M	1	L2
	b)	A 3 – phase, 1000 kVA, 6600 V/1100 V transformer is delta connected on the primary and star connected on the secondary. The primary resistance per phase is 1.8 ohm and secondary resistance per phase is 0.025 ohm. Determine the efficiency on full load at (i) Unity power factor (ii) 0.8 power factor lagging if the iron loss is 15 kW.	7M	4	L4
		UNIT–IV			
7.	a)	Explain the principle and operation of a 3 – phase induction motor by explaining rotating magnetic field.	7M	1	L2
	b)	A 3 – 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 (**iii**) Full load speed	7M	4	L5
		OR			

8.	a)	Draw and explain slip – torque characteristics of 3 – phase induction motor.	7M	2	L2
	b)	The power input to the rotor of 440 V, 50 Hz, 6 – pole, 3 – phase induction motor is 80 kW. The rotor emf is observed to make 100 complete alternations per minute. Calculate: (i) The slip (ii) The rotor speed (iii) Mechanical power developed (iv) The rotor copper loss per phase (v) The rotor resistance per phase if the rotor current is 65 A	7M	4	L5

UNIT–V

9.	a)	Explain the principal of operation of induction generator in detail and what are its limitations?	7M	1	L2
	b)	Explain any one method of starting of a 3 – phase induction motor.	7M	1	L2

OR

10.	a)	Explain any one speed control method of 3 – phase induction motor.	7M	3	L2
	b)	A 50 kW, 6 – pole, 50 Hz, 450 V, 3 – phase slip ring induction motor furnished the following test figures. No load test: 450 V, 20 A, p. f = 0.15 Blocked rotor test: 200 V, 150 A, p. f=0.3 The ratio of stator to rotor copper losses on short circuit was 5:4. Draw the circle diagram and determine from it (**i**) The full load current and power factor (**ii**) The maximum torque and the maximum power input (**iii**) Slip at full load (**iv**) efficiency at full load.	7M	4	L4

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Hall Ticket Number :										

R-17

Code: 7G345

II B.Tech. II Semester Supplementary Examinations March 2021

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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			Marks	CO	BL
		UNIT–I			
1.	a)	Draw the basic block diagram of an operational amplifier and explain its ideal characteristics.	7M	1	1
	b)	Discuss about the DC characteristics of an op-amp.	7M	1	2
		OR			
2.	a)	Determine the output voltage of an op amp for the input voltages of Vin1=150 μV, Vin2=140 μV. This amplifier has a differential gain of 4000 and the value of CMRR is 100 and for 105.	7M	1	3
	b)	Draw the Internal circuit diagram of an op-amp and explain in detail.	7M	1	1
		UNIT–II			
3.	a)	Evaluate and derive an expression for V_0 of the practical integrator circuit by using op-amp.	7M	2	6
	b)	Explain how op-amp acts as a summer and subtractor.	7M	2	3
		OR			
4.	a)	Analyze instrumentation amplifier circuit using op-amp and discuss its applications	7M	2	4
	b)	In an integrator circuit, R_iC_f=1sec, and the input is a step input V_{in}=2V for 0≤t≤4. Determine the output voltage and sketch it.	7M	2	3
		UNIT–III			
5.	a)	Design an anti-log amplifier using op-amp and explain it with the help of a circuit diagram.	7M	2	4
	b)	Construct a triangular wave generator by using op amp and explain its operation.	7M	2	5
		OR			
6.	a)	Design a monostable multivibrator using op amp and explain it with the help of a circuit diagram.	7M	2	4
	b)	Explain in detail about the precision rectifier using op-amp.	7M	2	2
		UNIT–IV			
7.	a)	Realize an astable multivibrator using 555 timer operating at 18KHz with 40% duty cycle.	7M	4	4
	b)	Explain the application of PLL as FSK demodulation.	7M	4	3
		OR			
8.	a)	Draw the basic block diagram of a PLL and explain its principle and operation.	7M	4	1
	b)	Explain the application of PLL as frequency translator.	7M	4	3
		UNIT–V			
9.	a)	For the R-2R ladder 4 bit type DAC, Find the output voltage and resolution if digital input is 1111. Assume V_R= 10*v* and *R* = 10*K* = R_f	7M	5	3
	b)	Discuss the operation of flash type ADC in detail.	7M	5	2
		OR			
10.	a)	Write short notes on the following: b) Resolution ii) Linearity iii) Settling time of a ADC	7M	5	1
	b)	Compare R-2R and weight resistor types of DAC.	7M	5	5

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Hall Ticket Number :										

R-17

Code: 7GC43

II B.Tech. II Semester Supplementary Examinations March 2021

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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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Show that $\int_0^1 \frac{x^{m-1}(1-x)^{n-1}}{(x+a)^{m+n}} = \frac{\beta(m,n)}{a^n(1+a)^m}$.	7M	2	II
	b)	Find all the roots of $\sin z = 2$.	7M	2	I
		OR			
2.	a)	Show that $\int_0^\infty x^n e^{-a^2x^2} = \frac{1}{2a^{n+1}}\Gamma\left(\frac{n+1}{2}\right), n > -1$	7M	2	II
	b)	Find all values of z which satisfy $\Gamma(z) = -2$.	7M	2	I
		UNIT–II			
3.	a)	Show that $f(z) = xy + iy$ is everywhere continuous but is not analytic.	7M	1	I
	b)	Find all the values of k such that $f(z) = e^x(\cos ky + i\sin ky)$ is analytic.	7M	1	I
		OR			
4.	a)	Show that the function $f(z) = \sqrt{\lvert xy\rvert}$ is not analytic at the origin, although Cauchy- Riemann equations are satisfied at the point.	7M	1	I
	b)	Find k such that $f(z) = x^3 + kxy^2$ may be harmonic and find its conjugate.	7M	1	I
		UNIT–III			
5.	a)	Evaluate $\int_C z^2\,dz$ where C is the straight line segment from $O(z=0)$ to $A(z=2+i)$.	7M	2	V
	b)	Express $f(z) = \frac{1}{z}$ as the Taylor series at the point $z = 1$.	7M	2	II
		OR			
6.	a)	Verify Cauchy's theorem for the function $f(z) = z^2 + iz - 4$ if C is the square with the vertices at $1 \pm i$ and $-1 \pm i$.	7M	2	III
	b)	Express $f(z) = \left(\frac{1}{1-z}\right)\left(\frac{1}{(z-2)}\right)$ as the Laurent's series expansion in an annulus region $1 < \lvert z\rvert < 2$.	7M	2	II
		UNIT–IV			
7.	a)	Show that $\int_{-\infty}^{\infty} \frac{\cos ax}{x^2+1}\,dx = \pi e^{-a}, a \geq 0$.	7M	3	II
	b)	Use Rouche's theorem to identify the number of zeros of the polynomial $f(z) = 2z^4 - 2z^3 + 2z^2 + 2z + 11$, that lie inside the circle $\lvert z\rvert = 1$.	7M	3	III
		OR			
8.		Solve $\int_{-\infty}^{\infty} \frac{dx}{(x^2+a^2)(x^2+b^2)}\,dx,\ a > 0, b > 0, a \neq b$.	14M	3	III
		UNIT–V			
9.	a)	Illustrate the image of the infinite strip $0 < y < \frac{1}{2}$ under the transformation $w = \frac{1}{z}$.	7M	2	II
	b)	Find the bilinear transformation that maps the point $(0,1,\infty)$ in the z-plane onto the point $(-1,-2,-i)$ in the w-plane.	7M	2	I
		OR			
10.	a)	Illustrate the image of the rectangle $R: -\pi < x < \pi, \frac{1}{2} < y < 1$ under the transformation $w = \sin z$.	7M	2	II
	b)	Find the bilinear transformation that maps $z_1 = 0, z_2 = 1, z_3 = \infty$ onto $w_1 = -1, w_2 = -i, w_3 = 1$ respectively.	7M	2	I

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Hall Ticket Number :										

R-17

Code: 7G244

II B.Tech. II Semester Supplementary Examinations March 2021

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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			Marks	CO	BL
		UNIT–I			
1.	a)	Three coils each having resistance 3Ω and inductive reactance 4Ω are connected (i) in star and (ii) in delta to a 415 V, 3-phase supply. Find for each connection (a) the line and phase voltages and (b) the phase and line currents.	7M	1	I
	b)	A three phase motor draws 9 KVA at a lagging PF of 0.8 from a balanced system with line voltages of 300V rms at 60Hz. Three capacitors of what size should be arranged as a parallel delta connected load to produce unity PF operation?	7M	1	I
		OR			
2.	a)	Under what condition will a single wattmeter read the total power taken by a balanced three phase load in a three wire system where the current coil is in one line and potential coil is between the other two lines	7M	1	I
	b)	A Delta Connected source is slightly unbalanced. Each source phase is a practical voltage source with a resistance of 0.1Ω, but the three voltages are $100\angle 0^\circ$, $101\angle -120^\circ$ and $99\angle 120^\circ$ V rms. Find the source phase currents under no-load conditions and the total power loss in the source.	7M	1	I
		UNIT–II			
3.	a)	Find the Laplace transform of each of the following functions (i) $2e^{-3\|t\|}$ (ii) $2e^{-3t}[u(t+3)-u(t-3)]$ (iii) $2e^{3t}[u(t+3)-u(t-3)]$	7M	2	I
	b)	Find F(s) if f(t)= : (i) $2e^{\sin t}\delta(t)$ (ii) $tu(t-2)$ (iii) $\delta(t-2)$	7M	2	I
		OR			
4.	a)	Find the partial fraction expansion of each of the following functions (i) $2s/(s^2+5s+4)$ (ii) $2/(s^2+2s+2)$ (iii) $s^3/(s^2+2s+1)$ (iv) $(4s+1)/(s^4+2s^3+s^2)$	7M	2	I
	b)	Find the inverse Laplace transform for the following functions (i) $(2s+3)/(s^2+1)$ (ii) $s^2/(s^4+3s^2+2)$	7M	2	I
		UNIT–III			
5.		For the circuit shown in figure 3 solve for $V_1(t)$ and $V_2(t)$ for $t>0$			

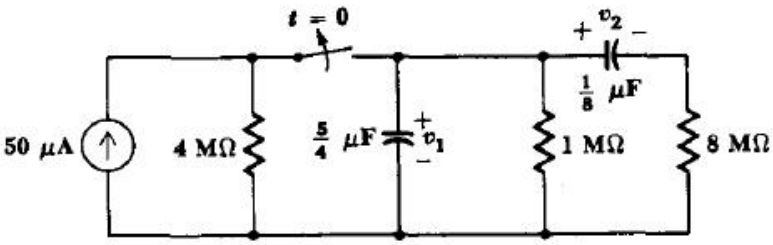

Figure 3 14M 3 III

OR

6. a) With reference to the circuit shown in figure 2, let $V(0) = 9V$.
Solve for $i(t)$ for $t > 0$

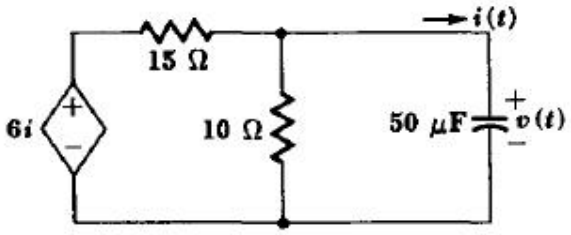

Figure 2 — 7M 3 III

b) After having been closed for a long time, the switch in the network of figure 1 is opened at t=0. Solve for $V_c(t)$ for $t > 0$

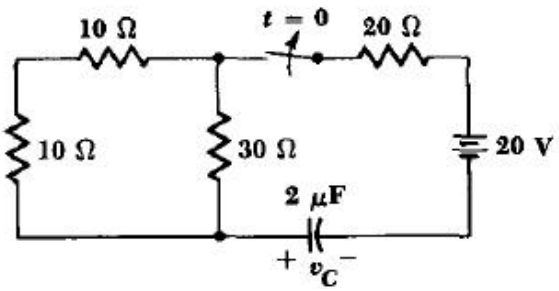

Figure1 — 7M 3 III

UNIT–IV

7. a) Explain the following properties of Fourier transforms
   (i) Linearity
   (ii) Differentiation
   (iii) Symmetry — 7M 4 II

b) Prove the Parseval's theorem statement? — 7M 4 V

OR

8. a) Explain evaluation of Fourier coefficients using unit impulses. — 7M 4 II

b) Prove that if $f(t)$ is even, its Fourier transform $F(j\omega)$ is also an even function — 7M 4 V

UNIT–V

9. a) Assess the following polynomials for the Hurwitz property.
   (i) s^3+4s^2+5s+2
   (ii) s^4+s^2+s+1
   (iii) s^5+2s^3+s — 7M 5 V

b) Determine whether the following functions are positive real
   (i) $(s^2+1)/(s^3+4s)$
   (ii) $(2s^2+2s+4)/((s+1)(s^2+2))$ — 7M 5 V

OR

10. a) Prove that if $Z_1(s)$ and $Z_2(s)$ are both positive real $Z(s) = \frac{Z_1(s)Z_2(s)}{Z_1(s)+Z_2(s)}$ Must also be positive real — 7M 5 V

b) Show that the product of two positive real functions need not be positive real. Also show that the ratio of one positive real function to another may not be positive real(Give one example each) — 7M 5 II

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Hall Ticket Number :										

R-17

Code: 7G242

II B.Tech. II Semester Supplementary Examinations March 2021

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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			Marks	CO	BL
		UNIT–I			
1.	a)	A circular disc of radius 'a' is charged uniformly with a charge density of ρ_s C/m^2. Find $\bar{E}$ at a point 'h' m from the disc along its axis	7M		
	b)	Find $\bar{D}$ at (4,0,3) due to point charge -15.734 mC at (4,0,0) and a line charge 9.427 mC/m along the y axis.	7M		
		OR			
2.	a)	State and prove Maxwell's first equation.	7M		
	b)	Four point charges, each 20µC are on the x and y axes at ±4 m. Find the force on a 200µC point charge at (0,0,3)m.	7M		
		UNIT–II			
3.	a)	Show that the torque on a physical dipole with moment $\bar{p}$ in a uniform electric field $\bar{E}$ is given by $\bar{p} X \bar{E}$.	7M		
	b)	Obtain the capacitance of co-axial cable capacitor using Laplace's equation.	7M		
		OR			
4.	a)	Derive the expression for capacitance of composite parallel plate capacitor.	7M		
	b)	If three point charges, 3µC, -4µC and 5µC are located at (0,0,0), (2,-1,3) and (0,4,-2) respectively, then the potential at (-1,5,2) assuming V(∞) = 0.	7M		
		UNIT–III			
5.	a)	Using Biot-savart law, find $\bar{H}$ due to infinitely long straight conductor.	7M		
	b)	Given the vector magnetic potential as, $\bar{A} = \frac{r^2}{4} a_x$ Wb/m in cylindrical system. Calculate the flux crossing the surface $\Phi = \frac{\Pi}{2}$, 1≤ r ≤ 2 m, 0≤ z ≤ 5 m	7M		
		OR			
6.	a)	Using Ampere's circuital law, find $\bar{H}$ due to a co-axial cable carrying current I.	7M		
	b)	A wire carrying a current of 100 A is bent into a square of 10 cm side. Calculate the field at the centre of the square.			
		UNIT–IV			
7.	a)	What is Magnetic moment? Derive an expression for torque on a closed loop.	7M		
	b)	A solenoid having a mean diameter of 20 cm and length of 50 cm has 1000 turns. This coil is placed co-axially inside another solenoid having a mean diameter of 60 cm and number of turns equal to 2000. The length of the outer solenoid is equal to that of inner solenoid. Compute L_1, L2 and M. Neglect magnetic leakage. Medium is air.	7M		
		OR			

8. a) Derive expression for mutual inductance using Neumann's formula. 7M

   b) A rectangular loop of wire in a free space joins point A(1,0,1) to B(3,0,1) to C(3,0,4) to A. The wire carries a current of 6 mA flowing in the a_z direction from B to C. A filamentary current of 15 A flows along entire z-axis in the a_z direction. Find force on the loop. 7M

UNIT–V

9. a) Explain the Faraday's disc generator and derive an expression for finding the un-known magnetic field. 7M

   b) The displacement current density is 5 cos $(2X10^8t - kz)a_x$ μA/m² in material for which σ =0, ε = $5\varepsilon_o$, μ = $4\mu_o$. Find the values of $\bar{D}$ and $\bar{E}$ 7M

OR

10. a) State poynting's theorem. What is Poynting vector? 7M

    b) A conductor of length 100 cm moves at right angles to uniform field of strength 10000 lines per cm², with a velocity of 50 m/s. Calculate e.m.f. induced it when the conductor moves at a angle 30^0 to the direction of the field. 7M

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Hall Ticket Number :										

R-17

Code: 7G243

II B.Tech. II Semester Supplementary Examinations March 2021

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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Marks

UNIT–I

1. a) Simplify the block diagram shown in figure 1 below and obtain the transfer function C(s)/R(s). Verify the result using signal flow graph

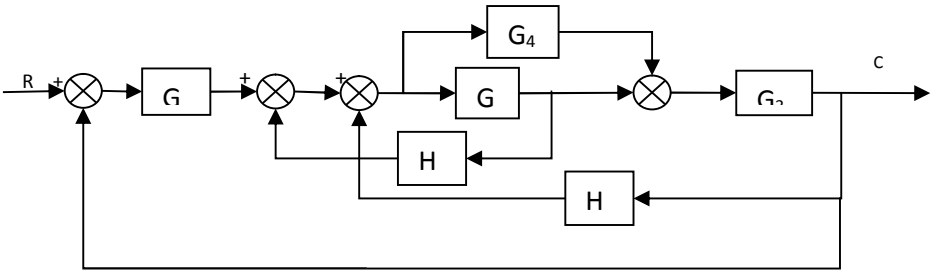

Figure 1 10M

b) Define transfer function and analyze it's limitations? 4M

OR

2. a) Compare Open loop and closed loop control systems 4M

b) Obtain the transfer function of a field control DC Servo motor 10M

UNIT–II

3. a) If x is the input and y is the output of the system described by the differential equation $\frac{d^2y}{dt^2} + 4\frac{dy}{dx} + 8y = 8x$. Determine the un-damped natural frequency, damping ratio, damped natural frequency, peak overshoot and settling time. Hence find the time response for unit step.

7M

b) Analyze the various test signals required in the analysis of steady state error analysis? 7M

OR

4. a) Derive the expressions for Delay time, Settling of a second order system. 6M

b) Valuate the static error constants for a unity feedback system having a forward path transfer function $G(s) = \frac{50}{s(s+10)}$. Estimate the steady state errors of the system for the input r(t) = 1 + 2t + t^2. 8M

UNIT–III

5. Find the conditions for stability of the systems whose characteristic equations given below. In each case, determine the value of K which will cause sustained oscillations and the frequency of Oscillations

a. $s^4 + 20s^3 + 224s^2 + 1240s + 2400 + K = 0$

b. $s^3 + (6K + 0.5)s^2 + 4Ks + 50 = 0$ 14M

OR

6. a) Analyze Relative stability of a system with suitable example? 4M

b) Given $G(s) = \frac{K}{s(s+1)(s+3)}$. 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. 10M

UNIT–IV

7. Sketch the bode plot for the transfer function given by $G(s) = \frac{10}{s(1+0.5s)(1+0.1s)}$ and hence determine the gain margin and the phase margin of the system. 14M

OR

8. The open loop transfer function of the unity feedback system is $G(s) = \frac{k}{s(s+2)(s+10)}$.

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

UNIT–V

9. The open loop transfer function of a unity feedback system is $G(s) = \frac{K_v}{s(s+2)}$. Design a suitable lead compensator to meet the following specification : K_v=12s^{-1}, φ_{pm}=45° 14M

OR

10. a) Design state model of a series RLC circuit with output voltage measured across capacitor and current denoted as I_L 7M

b) Design the basic lag compensator and draw the Bode plot 7M

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