Hall Ticket Number :										

R-17

Code: 7G345

II B.Tech. II Semester Regular & Supplementary Examinations November 2020

Analog Electronics-II

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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			Marks	CO	BL
1.	a)	Define an IC and give the classification of IC's in detail.	7M	1	1
	b)	Discuss the AC characteristics of an Op Amp	7M	1	2
2.	a)	Describe the internal block diagram of an Op-amp and explain each block in detail	7M	1	2
	b)	Draw the ideal characteristics of an op-amp and draw its block diagram.	7M	1	1
3.	a)	In an inverting adder circuit, the input voltages are 0.3V, 0.5V, 0.1V while $R_1=R_2=R_3=1$ KΩ, $R_f=10$KΩ. Calculate the output voltage.	7M	2	3
	b)	Evaluate and derive an expression for V_0 of the practical differentiator circuit by using op amp.	7M	2	6
4.	a)	Evaluate the time period of a free running astable multivibrator used as square wave generator using op-amp.	7M	2	6
	b)	Explain the working and operation of anti log amplifier using op-amp.	7M	2	2
5.	a)	Explain the working of a comparator using op amp. What are its limitations?	7M	2	2
	b)	Discuss in detail about the operation of sawtooth wave generator using op-amp.	7M	2	2
6.	a)	Realize a monostable multivibrator using 555 timer to obtain pulse of width of 0.1msec. Draw the circuit diagram with its waveforms.	7M	4	4
	b)	Realize the Schmitt trigger using a 555 timer IC.	7M	4	4
7.	a)	Draw and explain the principle of operation of dual slope ADC.	7M	5	2
	b)	A 12-bit D to A convertor has a full-scale range of 15 volts. Its maximum differential linearity error is ±1/2 LSB. i) What is the percentage resolution ii) What are the minimum and maximum possible values of the increment in its output voltage?	7M	5	3
8.	a)	Explain the working of a successive approximation ADC with neat sketches.	7M	5	1
	b)	Explain the operation of an R-2R ladder DAC and mention its applications.	7M	5	3

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Code: 7GC43

II B.Tech. II Semester Regular & Supplementary Examinations November 2020

Complex Variables and Special Functions

(Common to EEE & ECE)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
1.	a)	Show that $\beta(m,n) = \frac{\Gamma(n)}{\Gamma(m+n)}$, $m > 0$, $n > 0$.	7M	2	II
	b)	Find the general and principal values of $\log(1+i\sqrt{3})$.	7M	2	I
2.	a)	Show that $\beta\left(m,\frac{1}{2}\right) = 2^{2m-1}\beta(m,m)$.	7M	2	II
	b)	If $\tan(x+iy) = A+iB$ then show that $A^2+B^2+1 = 2A\cot 2x$.	7M	2	II
3.	a)	If $w = \log z$, find $\frac{dw}{dz}$ and Describe where w is non-analytic.	7M	1	I
	b)	Show that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\log\lvert f'(z)\rvert = 0$ where $f(z)$ is an analytic function.	7M	1	I
4.	a)	Evaluate $\int_C \bar{z}dz$ from $z=0$ to $z=4+2i$ along the curve $C: x=t^2, y=t$	7M	2	V
	b)	Express $f(z) = \frac{1}{z^2-3z+2}$ as a series in the region $0<\lvert z\rvert<1$.	7M	2	II
5.	a)	Show that $\int_C e^{-2z}dz$ is independent of the path C joining the points $1-\pi i$ and $2+3\pi i$. Determine its value.	7M	2	II
	b)	Find the Taylor's series expansion of e^z about $z=3$.	7M	2	I
6.		Evaluate $\int_0^{2\pi} \frac{d\theta}{17-8\cos\theta}$ by contour integration applying the calculus of residues.	14M	3	V
7.	a)	Show that the function $w=\frac{4}{z}$ transforms the straight line $x=c$ in the $z-$plane into a circle in the $w-$plane.	7M	2	II
	b)	Find the bilinear transformation which maps the points $z=1, i, -1$ onto the points $w=i, 0, -i$.	7M	2	I
8.	a)	Show that the relation $w=\frac{5-4z}{4z-2}$ transforms the circle $\lvert z\rvert=1$ into a circle of radius unity in the $w-$plane.	7M	2	II
	b)	Find the bilinear transformation which maps the points $(-1,0,1)$ into the points $(0,i,3i)$.	7M	2	I

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Code: 7G244

II B.Tech. II Semester Regular & Supplementary Examinations November 2020

Electrical Circuits-II

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
1.	a)	A single phase three wire system is fed by $V_{an} = V_{nb} = 100\angle 0^{\circ}$ V rms. The two outside line currents are $I_{aA} = 10 + j0$ and $I_{bB} = -9 + j1$ A rms. If load $Z_{AN} = 20 + j0$. Find Z_{BN} and Z_{AB}. Assume zero line resistance	7M	1	I
	b)	Explain the power measurement in a three phase circuit using two wattmeter method	7M	1	II
2.	a)	Find the inverse Laplace transform for the following function (i) s / (s+3) (ii) $\ln\left[\frac{s+1}{s+3}\right]$	7M	2	I
	b)	Find the both sides of the final value theorem for each of the following functions (i) $2s/(s^2+2s+2)$ (ii) $1/(s^4+4)$	7M	2	I
3.	a)	Find the Laplace transform for the following functions (i) $te^{-2t}u(t)$ (ii) $e^{-2t}\sin 4t\, u(t)$	7M	2	I
	b)	Find $f_1(t) \times f_2(t)$ if $f_1(t) = te^{-4t}u(t)$ and $f_2(t) = 5\cos 3t\, u(t)$	7M	2	I
4.	a)	For the circuit of figure 3, find the value at $t = 0^+$ of (i) V_1 (ii) V_2			

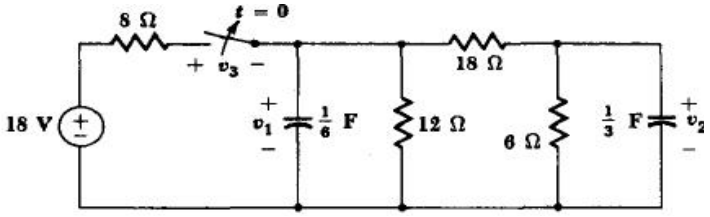

Figure 3 7M 3 I

	b)	Find $i_1(t)$, $i_2(t)$ For the circuit of figure 4,			

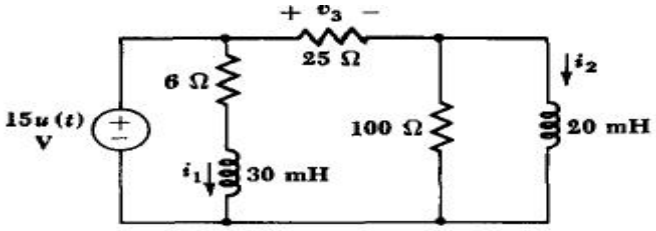

Figure 4 7M 3 I

5. a) Find $v(t)$ and $i(t)$ if $v(0) = 9\,V$ for the dependent voltage source circuit in figure5.

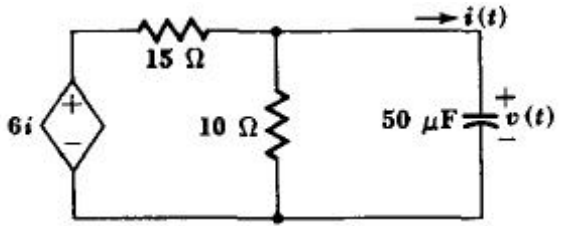

Figure 5 — 7M 3 I

b) Find the voltage across each of the three passive circuit elements in figure 6 at $t = 0^+$ if $v_{s=}$ (i)0; (ii) $12\,v$

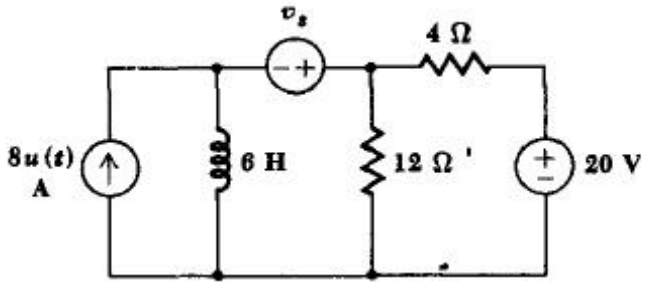

Figure 6 — 7M 3 I

6. a) Explain the evaluation of Fourier coefficients by symmetry consideration — 7M 4 II

b) Show that if $f(t)$ is odd, its fourier transform is odd and pure imaginary. — 7M 4 II

7. a) Explain the elementary the synthesis procedures? — 7M 5 V

b) Synthesize $Z(s) = \frac{(s+2)(s+4)}{(s+1)(s+5)}$ into the form shown in figure 7

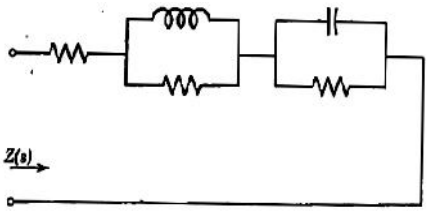

Figure 7 — 7M 5 II

8. a) Determine the following function is a positive real or not

$$Z(s) = \frac{6s^3 + 3s^2 + 3s + 1}{6s^3 + 3s}$$

— 7M 5 V

b) Synthesize the L-C driving point impedance $Z(s) = \frac{6s^4+42s^2+48}{s^5+18s^3+48s}$

In the form shown in figure 8, i.e., determine the element values of the network in henrys and farads

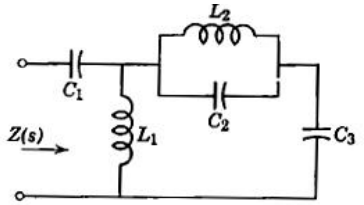

Figure 8 — 7M 5 V

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II B.Tech. II Semester Regular & Supplementary Examinations November 2020

Electromagnetic Fields

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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			Marks
1.	a)	Find $\vec{E}$ at any point due to a line charge of density λ C/m and length 'L' m.	7M
	b)	If $\vec{D} = 20xy^2(z+1)a_x + 20x^2y(z+1)a_y + 10x^2y^2\,a_z$ C/m^3, calculate charge density at P (0.3,0.4,0.5).	7M
2.	a)	Derive $\nabla \cdot \vec{D} = \rho_v$ from the fundamentals.	7M
	b)	On the line x = 4 and y = -4, there is a uniform charge distribution with density ρ_L = 25 nC/m. Determine $\vec{E}$ at (-2,-1,4)m.	7M
3.	a)	Derive the expression for capacitance of co-axial cable.	7M
	b)	A line charge of 20/3 nC/m is uniformly distributed along a circular ring of radius r = 2m. Find the potential at a point on the axis of a ring 5m from the plane of the ring.	7M
4.	a)	Using Biot-savart law, find $\vec{H}$ at the centre of a circular conductor.	7M
	b)	State and prove Maxwell's third equation.	7M
5.	a)	Using Ampere's circuital law, find $\vec{H}$ due to infinitely long straight conductor.	7M
	b)	A wire is bent into a square coil. Each side of the coil has a length of 20 cm. The coil carries a current of 10 A. The medium is air. Find the vector magnetic potential at the centre of the coil.	7M
6.	a)	Derive an expression for the force between two current carrying conductors in the same direction.	7M
	b)	Find self inductance of a solenoid having 500 turns, mean diameter equal to 10 cm and length equal to 5 cm. Assume medium to be air.	7M
7.	a)	Write down Maxwell's equations in their general integral form.	7M
	b)	Derive expression for displacement current.	7M
8.	a)	State and explain the Faraday's law of electromagnetic induction	7M
	b)	Discuss about motional and transformer induced emf?	7M

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II B.Tech. II Semester Regular & Supplementary Examinations November 2020

Linear Control Systems

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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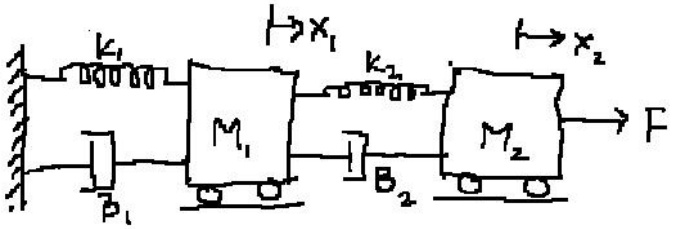
			Marks	CO	Blooms Level
1.	a)	Derive the transfer function relating input F and x_1 for the system shown in figure below 	8M		
	b)	Explain about open loop system and closed loop systems.	6M		
2.		Derive the expressions for rise time, peak time and maximum peak overshoot of a second order system.	14M		
3.	a)	Explain about different types of test signals.	7M		
	b)	A unity feedback system is characterized by the open loop transfer function $G(s) = \frac{k}{s(s+10)}$. Determine the gain K, so that the system has a damping ratio of 0.5. For this value of K, determine peak time, settling time, peak overshoot.	7M		
4.		The open loop transfer function of a control system is given by $G(s)H(s) = \frac{k}{s(s+6)(s^2+4s+13)}$. Sketch the root locus and determine a. The break-away points, b. The angle of departure c. The stability condition	14M		
5.	a)	Define stability of a control system and explain about characteristic equation.	4M		
	b)	The open loop transfer function of a unity feedback system is $G(s) = \frac{K}{(s+2)(s+4)(s^2+6s+25)}$. By applying Routh Criterion, discuss the values of K which will cause sustained oscillations in the closed loop system and the corresponding frequencies	10M		
6.		The open loop transfer function of a unity feedback system is given by $G(s) = \frac{K(s+20)}{(s+1)(s+2)(s+10)}$. Construct the bode plot for K = 10 and determine the phase margin, gain margin, phase crossover frequency and gain cross over frequency.	14M		
7.		The open loop transfer function of a unity feedback system is $G(s) = \frac{1}{s(1+s)(1+2s)}$ Sketch the polar plot and determine the gain margin and phase margin	14M		
8.	a)	Design the basic lead compensator using Bode plot	7M		
	b)	Obtain the state space representation of the field controlled DC motor	7M		

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II B.Tech. II Semester Regular & Supplementary Examinations November 2020

AC Machines-I

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
1.	a)	Explain the constructional details of Single phase transformers.	7M	1	L2
	b)	Explain the losses that occur in Transformers	7M	1	L2
2.	a)	Derive the e.m.f equation of Single phase Transformer.	7M	1	L2
	b)	Explain the effect of variations of frequency and supply voltage on core losses.	7M	1	L2
3.	a)	Explain the principle and operation of an Auto transformer in detail.	7M	2	L2
	b)	A single phase transformer working at unity power factor has an efficiency of 90 % at both half load and at the full load of 500 W. Determine the efficiency at 75 % full load.	7M	4	L3
4.		What is meant by 3 – phase transformer groups? What is the significance of these groups? What are the possible connections for a 3 – phase transformer bank? Explain.	14M	3	L4
5.	a)	Explain how will you pre determine the efficiency and regulation by conducting OC & SC tests on a single phase transformer with neat circuit diagrams.	7M	2	L2
	b)	A 50 kVA, 2200 V/1100 V single phase 50 Hz transformer has a full-load efficiency of 95% and iron loss of 500 W. The transformer is connected as an Auto-transformer to a 3300 V supply. When it delivers a load of 50 kW at unity power factor at 1100 V, Calculate the currents in the windings. Find also the increase in output as auto-transformer also calculate the copper losses as two winding transformer.	7M	4	L3
6.	a)	Explain the constructional details of 3 – phase induction motors.	7M	1	L2
	b)	A 3 – phase, 50 Hz, 4 – pole induction motor has a slip of 4%. Calculate: (i) Speed of the motor (ii) Frequency of the rotor emf.	7M	4	L4
7.	a)	What is circle diagram and what is its significance? How it can be drawn.	7M	1	L2
	b)	Explain any one speed control method of 3 – phase induction motor.	7M	3	L2
8.	a)	Explain any one starting method of 3 – phase induction motors.	7M	3	L2
	b)	Explain the principle of operation of Induction generator.	7M	1	L2

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