Hall Ticket Number :										

R-19

Code: 19A244T

II B.Tech. II Semester Supplementary Examinations February 2022

Linear Control Systems

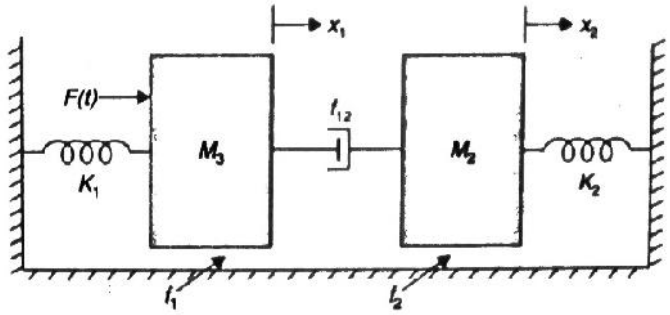
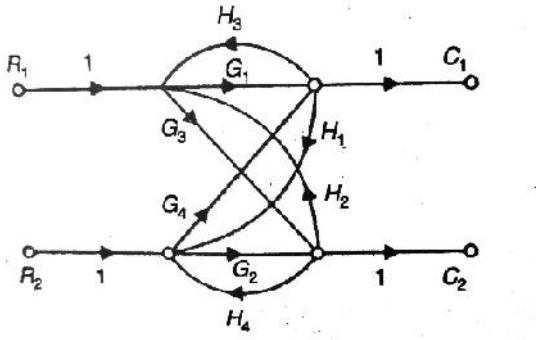
(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

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

Use of rectangular graphs, semi log sheets and polar graphs are permitted

****

			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Write the differential equations for the given mechanical system. Also obtain an analogous electrical circuit based on force-current analogy. 	8M	1	2
	b)	Derive the transfer function of an ac servo motor	6M	1	2
		OR			
2.	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
		UNIT–II			
3.		Determine the time response of a second order system with a unit step input. Also deduce the steady state error value	14M	2	1
		OR			
4.		A unity feedback system is characterized by the open loop transfer function G(s) = 10/s*(0.1s+1). Determine the static error constants for the system. Obtain the steady state error when the system is subjected to an input given by the polynomial r(t) = a_0 +a_1*t+a_2 *t^2/2	14M	2	1

UNIT–III

5. a) Find the roots of the characteristic equations for systems whose open loop transfer functions are given below:
   i) $G(s)\,H(s)= 1/ [(s+2)\,(s+4)]$
   ii) $G(s)H(s) = 1(s+3) / [s(s+3)\,(s+8)]$
   iii) $G(s) = 9 / [s^2*(s+2)]$. 9M 3 2

   b) The characteristic equation of a servo system is given by $a_0s^4+a_1s^3+a_2s^2+a_3s+a_4=0$. Determine the conditions which must be satisfied by the coefficients in the characteristic equations for the system to be stable 5M 3 2

OR

6. Sketch the root locus plot of a unity feedback system which has an open loop transfer function of $G(s) = K / [s*(s^2+4s+13)]$. 14M 3 2

UNIT–IV

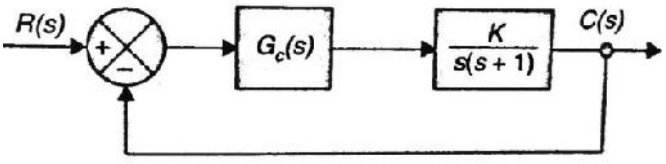
7. Sketch the bode plot of a feedback system which has $G(s)H(s) = 100*(s+4) / [s*(s+0.5)\,*(s+10)]$. Also comment on the stability of the system. 14M 3 2

OR

8. Sketch the polar plot for the given transfer function and determine the frequency at which the plot crosses real axis and the corresponding magnitude.
   $G(s) = 1/ [s^2*(1+s)\,(1+2s)]$. 14M 3 2

UNIT–V

9. Determine the lead compensator for the given system to meet the following specifications:
   i) The phase margin of the system must be greater than 45^o
   ii) The gain cross over frequency of the system must be less than 7.5 rad / sec.



14M 2 1

OR

10. A continuous time system has a transfer function $T(s) = 10(s+4) / s*(s+1)\,*(s+3)$. Construct three different state models for the system and give block diagram representation for each state model. 14M 4 2

END

Hall Ticket Number :										

R-19

Code: 19AC44T

II B.Tech. II Semester Supplementary Examinations February 2022

Life Sciences for Engineers

(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)

****

			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	What is chloroplast? Explain in detail about its structure and functions and also draw the labeled diagram?	7M	1	1
	b)	What is molecular taxonomy? Explain its role in the classification of living organisms	7M	1	2
		OR			
2.		Explain the differences between prokaryotes and eukaryotes?	14M	1	1
		UNIT–II			
3.	a)	Describe the structure of hemoglobin and draw the labeled diagram?	7M	2	1
	b)	What are antibodies and elaborate its structure with suitable diagram?	7M	2	2
		OR			
4.		Write in detail about the structure and functions of nucleic acids?	14M	2	2
		UNIT–III			
5.		What is photosynthesis and explain the mechanism of photosynthesis?	14M	3	1
		OR			
6.	a)	Elaborate oxidative phosphorylation?	7M	3	1
	b)	Write the industrial applications of enzymes with suitable examples?	7M	3	2
		UNIT–IV			
7.		What is cell division? Elaborate mitosis and meiosis with suitable diagrams?	14M	4	2
		OR			
8.	a)	What are the three laws of inheritance with examples?	7M	4	1
	b)	What is RNA? Explain its structure and functions and draw labeled diagram?	7M	4	3
		UNIT–V			
9.	a)	Define transgenecis and explain the applications of transgenic microbes?	7M	5	4
	b)	What are biosensors and biochips and add a note on their applications?	7M	5	3
		OR			
10.		What is recombinant DNA technology and explain various steps involved in recombinant DNA technology?	14M	5	1

END

Hall Ticket Number :										

R-19

Code: 19AC42T

II B.Tech. II Semester Supplementary Examinations February 2022

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)

****

			Marks	CO	Blooms Level

UNIT–I

1. a) By using Regula – False method, determine an approximate root of the equation $x^4 - x - 10 = 0$ that lies between 1.8 and 2. Carry out three approximations. 7M 1 3

   b) Solve $x^3 = 2x + 5$ for a positive root by iteration method. 7M 1 3

OR

2. a) Determine $y(54)$ of the following table using Newton's forward formula

x	50	60	70	80
y	205	225	248	274

7M 1 3

   b) The population of a town is as follows

years	1921	1931	1941	1951	1961	1971
population	20	24	29	36	46	51

Estimate the increase in population during the period 1955 to 1961. 7M 1 3

UNIT–II

3. a) Evaluate $\int_0^{\cdot 5} \frac{dx}{4x+5}$ by Trapezoidal rule using 11 coordinates. 7M 2 5

   b) Evaluate $\int_0^{\cdot 1} \frac{dx}{\sqrt{1+x^4}}$ by Trapezoidal rule using Simpson's $\frac{3}{8}$ rule. 7M 2 5

OR

4. a) Using Taylor's series, determine y at $x = 0.1$ and $x = 0.2$ given $\frac{dy}{dx} = y^2 + x, \quad y(0) = 1$ 7M 2 3

   b) By using Runge-Kutta third order formula determine $y(0.25)$, when $\frac{dy}{dx} = 1 + xy$ and $y(0) = 1$? 7M 2 3

UNIT–III

5. a) Determine the Taylor's series to represent the function $\frac{z^2-1}{(z+2)(z+3)}$, in the region $|z| < 2$ 7M 3 3

   b) Determine the Laurent series expansion of the function $f(z) = \frac{z^2-6z-1}{(z-1)(z-3)(z+2)}$ *in the region* $3 < |z+2| < 5$ 7M 3 3

OR

6.	a)	Determine the poles and residues at each pole $\frac{ze^z}{(z-1)^3}$	7M	3	3
	b)	Evaluate $\oint_C \frac{4-3z}{z(z-1)(z-2)}dz$ where C is the circle |z|=3/2 using residue theorem.	7M	3	5
		UNIT–IV			
7.	a)	Determine the Fourier transform of f(x) defined by $f(x) = \begin{cases} 1, & \|x\| < a \\ 0, & \|x\| > a \end{cases}$	7M	4	3
	b)	Using Fourier integral, show that $\int_0^\infty \frac{1-\cos\pi\lambda}{\lambda} \sin x\lambda d\lambda = \begin{cases} \frac{\pi}{2}, & if\ 0 < x < \pi \\ 0, & if\ x > \pi \end{cases}$	7M	4	3
8.	a)	Determine the Fourier sine and cosine transforms of $f(x) = \frac{e^{-ax}}{x}$ and deduce that $\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x} \sin sx dx$ t = tan^{-1}{s/a}-tna^{-1}{s/b}.	7M	4	3
	b)	Determine the Fourier cosine transforms of f(x) = e^{-ax} cosax	7M	4	3
		UNIT–V			
9.	a)	Showthat $Z(\cos n^-) = \frac{z(z-\cos^-)}{z^2 - 2z\cos^- + 1}$ and $Z(\sin n^-) = \frac{z\sin^-}{z^2 - 2z\cos^- + 1}$	7M	5	3
	b)	Solve the difference equation using Z-transform y (n + 2) + 5y(n + 1) + 4y(n) = 2^n given that y(0) = 1, y(1) = – 4.	7M	5	3
		OR			
10.	a)	Using convolution, determine Z-Transform of $\left[\frac{z^2}{(z-1)(z-3)}\right]$	7M	5	3
	b)	Using the Z –transform , solve $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$ with $u_0 = 0$, $u_1 = 1$	7M	5	3

END

Hall Ticket Number :										

R-19

Code: 19A242T

II B.Tech. II Semester Supplementary Examinations February 2022

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)

****

			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	State and explain Coulomb's law in vector form?	7M	CO1	L3
	b)	Calculate EFI at a point P (3, -4, 2) in free space for Q_1 =2μc at (0, 0, 0) and Q_2=3μc at (-1, 2, 3).	7M	CO1	L3
		OR			
2.	a)	Derive the expression for Electric Field Intensity due to Infinite sheet of charge using Gauss' law?	7M	CO1	L3
	b)	State and Explain Maxwell's Second equation?	7M	CO1	L3
		UNIT–II			
3.	a)	Derive the expression for electric potential and EFI due to an electric dipole?	7M	CO2	L1
	b)	Write short notes on conduction and convection current density?	7M	CO2	L1
		OR			
4.	a)	Derive the conditions at the boundary between two dielectrics?	7M	CO2	L1
	b)	Derive the Laplace's and Poisson's equations in an electric field?	7M	CO2	L1
		UNIT–III			
5.	a)	Using Biot-Savart's Law find MFI due to a straight current carrying filament?	7M	CO3	L3
	b)	State and explain Ampere's Circuital Law?	7M	CO3	L3
		OR			
6.	a)	Derive the expression for vector magnetic potential from Biot-Savart's law.	7M	CO3	L3
	b)	State and Explain Maxwell's Fourth equation?	7M	CO3	L3
		UNIT–IV			
7.	a)	Derive the expression for force on a current element in a magnetic field?	7M	CO4	L1
	b)	Two long parallel conductors are separated by 2 cm in air carrying current of 100A flowing in opposite directions. Find the force per meter length of the conductor?	7M	CO4	L1
		OR			
8.	a)	Derive the expression for torque on a current loop placed in a magnetic field?	7M	CO4	L1
	b)	Derive the expression for energy stored and energy density in the magnetic field	7M	CO4	L1
		UNIT–V			
9.	a)	State and explain Faraday's laws of electromagnetic induction in point form and Integral form?	7M	CO5	L3
	b)	Derive the expression for modified Maxwell's equation for time varying fields.	7M	CO5	L3
		OR			
10.	a)	Find the displacement current within a parallel plate capacitor where $\varepsilon=100\varepsilon_o$, $A=0.1m^2$, d=0.05mm and the capacitor voltage is 100 sin2000π t volts.	7M	CO5	L3
	b)	State and explain Poynting theorem? What is the significance of Poynting Vector?	7M	CO5	L3

END

Hall Ticket Number :										

R-19

Code: 19A241T

II B.Tech. II Semester Supplementary Examinations February 2022

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)

****

			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Explain the effects of skewing the rotor slots in a squirrel cage induction motor. Discuss the factors determining the choice of rotor slots in a squirrel cage induction motor.	8M	2	4
	b)	The rotor emf of a 3 phase, 6 pole, 400V,50Hz induction motor alternates at 3Hz. Compute the speed and percentage slip of the motor. Find the rotor copper loss per phase, if the full load input to rotor is 111.9 kW.	6M	4	3
		OR			
2.	a)	Explain the terms slip, slip frequency, wound rotor and cage rotor.	8M	1	L1
	b)	What is the most commonly used 3-phase ac motor? Justify the reason.	6M	2	4
		UNIT–II			
3.	a)	How is the speed of a 3-phase induction motor controlled by its stator voltage control? Show that the region of speed control by the method is limited by the slip at which maximum torque develops.	9M	3	3
	b)	What are the applications of different starters?	5M	3	L3
		OR			
4.	a)	What synchronous speeds can be obtained from the combination of 50 Hz induction motors having 8 poles and 4 poles?	6M	4	3
	b)	Derive the induction motor torque speed characteristic under V/f control. Explain why E/f control is superior to V/f control.	8M	2	4
		UNIT–III			
5.	a)	Prove that a single-phase motor winding when excited by a single-phase supply produces two equal and opposite revolving fields.	8M	5	4
	b)	State the reasons for the inferior performance of single-phase induction motors compared to three phase motors.	6M	6	4
		OR			
6.	a)	Draw the equivalent circuit of single-phase induction motor with the help of double field revolving theory.	7M	2	4
	b)	Show that the starting torque of a single-phase induction motor is zero.	7M	5	4
		UNIT–IV			
7.	a)	Derive from first principles, the emf equation of a 3-phase synchronous machine.	7M	1	1
	b)	What are the causes of harmonics in the voltage waveform of an alternator? How can these be minimized?	7M	1	1
		OR			
8.	a)	Explain how the armature reaction influences the field distribution of an alternator for varying power factor.	8M	2	4
	b)	Compare synchronous impedance method and ampere turn method of predetermining regulation of alternators.	6M	1	1
		UNIT–V			
9.	a)	Mention the need for parallel of alternators. State the conditions to be satisfied before connecting an alternator to the infinite bus bars.	8M	1	1
	b)	What are the advantages of connecting the alternators in parallel?	6M	1	L1
		OR			
10.	a)	Explain the construction and principle of operation of a synchronous motor.	7M	1	1
	b)	What is a synchronous condenser? Show the region of operation of the condenser on v-curves. Where are synchronous condensers used?	7M	3	3

END

Hall Ticket Number :										

R-19

Code: 19A342T

II B.Tech. II Semester Supplementary Examinations February 2022

Fluid Mechanics and Hydraulic Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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

****

		Marks	CO	Blooms Level
	UNIT–I			
1. a)	Explain the working of a Bourdon pressure gauge with a neat sketch.	7M	1	L2
b)	An open tank contains water upto a depth of 1.5 m and above it an oil of specific gravity 0.8 for a depth of 2 m. Find the pressure intensity: i) at the interface of the two liquids, and ii) at the bottom of the tank	7M	1	L3
	OR			
2. a)	Explain with neat sketch of the following: i) Simple manometers ii) U tube manometers	6M	1	L2
b)	A liquid is compressed in the cylinder having the volume of 0.0012 m^3 at a pressure of 690 N/cm^2. What would be the new pressure in order to make its volume 0.0119m^3? Assume bulk modulus of elasticity of the liquid $6.9\times10^4 N/cm^2$.	8M	1	L3
	UNIT–II			
3. a)	What is a pitot tube? How will you determine the velocity at any point using pitot tube?	6M	2	L2
b)	A crude oil of kinematic viscosity 0.4 stoke is flowing through a pipe of diameter 300 mm at a rate of 300 litres/sec. Find the head lost due to friction for a length of 50 m of a pipe.	8M	2	L3
	OR			
4. a)	State Bernoulli's theorem. Derive it from the first principle and also state the assumptions.	7M	2	L5,L6
b)	An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the ratio of flow of oil of specific gravity 0.9 when the coefficient of discharge of the orifice meter is 0.64.	7M	2	L3
	UNIT–III			
5. a)	Discuss a pumped storage type of power station.	6M	3	L2
b)	A turbine works with overall efficiency of 83%. The gross head and flow rate are 88 m and 20 m^3/sec. The frictional losses in penstock are 4 m. Calculate the power developed.	8M	3	L3

OR

6.		A jet of water having velocity of 45 m/s impinges without a shock on a series of vanes moving at 15 m/s , the direction of the motion of vanes being inclined at 20° to that of the jet. The relative velocity at outlet is 0.9 of that at inlet, and the absolute velocity of water at exit is normal to the motion of vanes. Find: i. vane angles at entrance and exit ii. work done on vanes per unit weight of water supplied by the jet and iii. the hydraulic efficiency	14M	3	L3

UNIT–IV

7.	a)	By means of a neat sketch, explain the governing mechanism of Francis Turbine.	7M	4	L2
	b)	A turbine is to operate under a head of 25 m at 200 rpm. The discharge is 9 cumec. If the efficiency is 90%, determine the performance of the turbine under a head of 20 m.	7M	4	L3

OR

8.		Design a single jet Pelton wheel to develop a power of 500 KW under a head of 160 m while running at 300 rpm. Assume Ku = 0.45, Cv = 0.985 and overall efficiency = 80%. Calculate the jet diameter, wheel diameter and number of buckets. Give a fully dimensional sketch of a bucket.	14	4	L3,L6

UNIT–V

9.	a)	Explain the construction, principle and working of a Reciprocating pump with a neat sketch.	7M	5	L2
	b)	The internal and external diameters of the impeller of a centrifugal pump are 225 mm and 450 mm respectively. The pump is running at 1100 rpm. The vane angles at inlet and outlet are 250 and 350 respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water	7M	5	L3

OR

10.	a)	Explain: Slip and Indicator Diagram.	6M	5	L2
	b)	A single acting reciprocating pump has piston of diameter 150mm and stroke of length 250 mm. The piston makes 50 double strokes per minute. The suction and delivery heads are 5 m and 15 m respectively. Find (i) discharge capacity of the pump in litres per minute; (ii) force required to work the piston during the suction and delivery strokes if the efficiency of suction and delivery strokes are 60% and 75% respectively; and (iii) power required to operate the pump	8M	5	L3

END