Hall Ticket Number :										

R-15

Code: 5GC41

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 $(m,n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ 7M

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

   (i) $\frac{x^2}{\cosh^2 u}+\frac{y^2}{\sinh^2 u}=1$ (ii) $\frac{x^2}{\cos^2 v}-\frac{y^2}{\sin^2 v}=1$ 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 $f(z)=\frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}(z\neq 0), f(0)=0$ 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 $u-v=\frac{\cos x+\sin x-e^{-y}}{2(\cos x-\cosh y)}$ and $f\left(\frac{\pi}{2}\right)=0$. 7M

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

UNIT–III

5. Find the Taylor's expansion of $f(z)=\frac{2z^3+1}{z^2+z}$ 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 $\int_0^{2®} \frac{\cos 2^{-}}{1-2a\cos^{-}+a^2} d^{-} = \frac{2® a^2}{1-a^2}, (a^2 < 1)$ 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-15

Code: 5G242

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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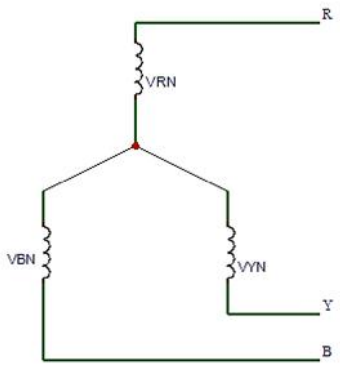
UNIT–I

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

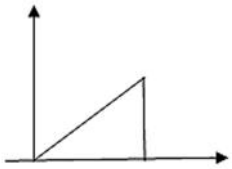
OR

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.



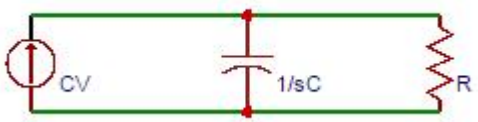
7M

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

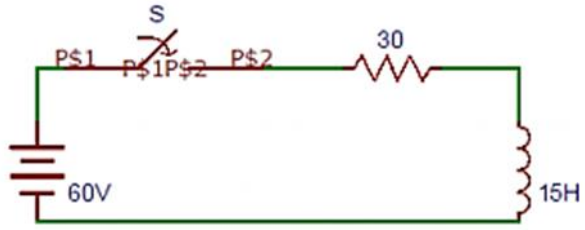
b) The voltage across the resistor in the parallel circuit shown is?



7M

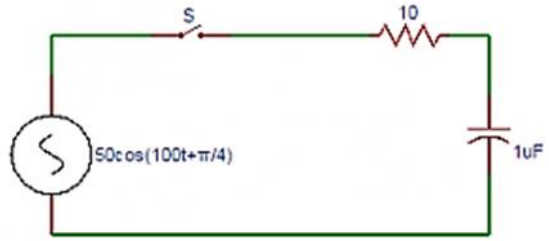
UNIT–III

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

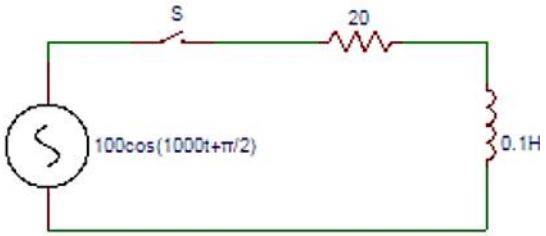
b) In the circuit shown below, the switch is closed at t = 0, applied voltage is v(t)=50cos (102t+π/4), resistance R = 10Ω and capacitance C = 1μF. The complementary function of the solution of 'i' is?



7M

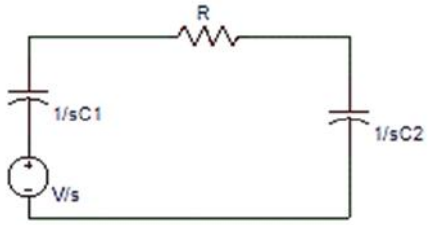
OR

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

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

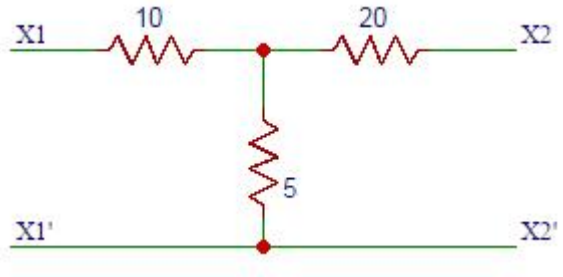
$$f(t)=\begin{cases} t+1, & for \quad -1\le t<0 \\ 1-t, & for \quad 0\le t<1 \\ 0, & else \end{cases}$$

7M

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

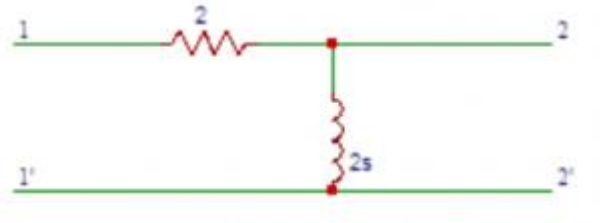
UNIT–V

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-15

Code: 5G345

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

Electronic Circuit Theory

(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) Draw the small-signal model of an Emitter-Follower ,determine R_i,R_o and show that the voltage gain is close to unity 8M

   b) For a CE Amplifier, the biasing resistors R_1=47KΩ, R_2=10KΩ, R_E=470Ω, R_C=2.2KΩ and V_{CC}=12V. The small-signal parameters are h_{ie}=1.17KΩ, h_{oe}=2μA/V, h_{fe}=120. Determine the input and output impedance, Voltage gain and current gain. 6M

OR

2. a) Sketch the circuit of a CS Amplifier. Derive Z_i, Z_o and A_v. 8M

   b) Compare the three different coupling schemes used in amplifiers. 6M

UNIT–II

3. Draw Hybrid - π model for a transistor in the CE configuration and Derive all components in terms of h parameters. 14M

OR

4. a) Prove that in PNP transistor operating in the active region, the diffusion capacitance C_{DE} at emitter junction J_E equals to $W^2.gm/2D_B$ 8M

   b) Obtain the expression for short circuit current gain of CE amplifier 6M

UNIT–III

5. a) Describe the four types of feedback topologies. 7M

   b) What is the relationship between the transfer gain with feedback A_f and without feedback A? 7M

OR

6. a) Draw the circuit of a voltage-Shunt Amplifier and derive the expressions for input and output resistance. 8M

   b) Define the term feedback factor β and amount of feedback. 6M

UNIT–IV

7. a) Explain the Barkhausen criterion for sinusoidal oscillations to be sustained. 6M

   b) Explain the operation of Hartley oscillator and obtain the expression for frequency and condition for sustained oscillations. 8M

OR

8. a) What are the factors that affect the stability of an oscillator? How Frequency stability can be improved in oscillations. 6M

   b) For a Colpitts oscillator with C_1=1nF, C_2=99nF, L=1.5mH, L_{RFC}=0.5mH, C_c=10μF, h_{fe}=110. Calculate the frequency of oscillations and predict the condition for sustained oscillations. 8M

UNIT–V

9. a) Differentiate between push-pull and complementary symmetry configuration of a class B power amplifier 6M

   b) Derive the expression for efficiency of a transformer coupled Class A power amplifier 8M

OR

10. a) Define Q-factor and compare various tuned amplifiers. 8M

    b) Explain the operation of a single tuned capacitance coupled amplifier circuit and its frequency response 6M

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Hall Ticket Number :										

R-15

Code: 5G241

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

Electrical Machines-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) Define a transformer? Why the transformer core is laminated? 8M

   b) An 1100/400 V, 50 Hz single phase transformer has 100 turns on the secondary winding. Calculate the number of turns on its primary, transformation ratio and turns ratio. 6M

OR

2. A single phase 50Hz transformer has 440turns on the primary and 110turns on the secondary winding takes a no-load current of 5A at 0.2 power factor lagging. If the secondary supplies a current of1 20A at a power factor of 0.8 lagging. Estimate the current taken by the primary. Take secondary voltage as reference. 14M

UNIT–II

3. a) Define all day efficiency of a transformer and Why transformers are rated in KVA but not in KW? 7M

   b) The full load copper loss on the HV side of a 100 kVA, 1100/317V, single phase transformer is 0.62kW and on the LVside is 0.48kW.Calculate :(i) R_1 and R_2inohms.ii)The total reactance is 4percent, find X_1 and X_2 in ohms if the reactance is divided in the same proportion as resistance. 7M

OR

4. The performance of 500KVA, 10KV / 500V, 50HZ transformer is as follows: when working at UPF has an efficiency of 98% at full-load and also at half –load, and 2.5% regulation at full load 0.8 lag pf. Calculate (i) The efficiency at ¾ th full load, 0.8 lagp.f (ii) Maximum efficiency ay 0.8 lag pf (iii) Regulation at full load UPF (iv) Regulation at ½ full load 0.6 Lead pf. 14M

UNIT–III

5. Explain the scott connection of three phase transformer with neat diagram. 14M

OR

6. Two identical transformers each of rating 5 KVA, 200 V/100 V, 50 Hz transformers are connected in open delta. Calculate the KVA rating of the open delta bank when HV side is used as primary. 14M

UNIT–IV

7. a) Explain the principle of operation of Induction motor. 7M

   b) A 4 pole, 3-phase induction motor operates from a supply whose frequency is 50Hz. Calculate.

   i. the speed at which the magnetic field of the stator is rotating.

   ii. the speed of the rotor when the slip is 0.04

   iii. the frequency of the rotor currents when the slip is 0.03

   iv. the frequency of the rotor currents at standstill. 7M

OR

8. a) Describe the constructional details of cage and wound rotor induction machines. 7M

   b) A 3-phase induction motor runs at 1440 rpm at full load when supplied power from 50Hz, 3-phase line. Calculate: (i) The number of poles. (ii) Slip of full load.

   (iii) Speed of the stator field w.r.t Stator structure and rotor structure.

   (iv) Speed of the rotor field w.r.t Stator structure and rotor structure. 7M

UNIT–V

9. a) Explain no load tests and blocked rotor tests for an 3-phase induction motor. 7M

   b) In a no load test, an induction motor took 10 A and 450 W with a line voltage of 110V. If stator resistance per phase is 0.05 Ω and friction and windage losses amount to 135 W. calculate the exciting conductance and susceptance/ph. 7M

OR

10. a) List out the types of starters used for starting of 3 – phase induction motors. Explain line starting of an induction motor. 7M

    b) A 3-phase cage induction motor has a short circuit current equal to 5 times the full load current. Find the starting torque as the % of full load torque, if the motor is started by (i) DOL starter (ii) Star-Delta starter (iii) an Auto Transformer starter with X% tapping . Starting Current in (iii) is to be limited to 2.5 times the full load current. Full load slip is 4%. 7M

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Hall Ticket Number :										

R-15

Code: 5G243

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

Generation of Electric Power

(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. Write a short note on Boiling Water reactor and also write the advantages and disadvantages.

OR

2. a) Explain about the growth of power systems in India?

   b) What is the function of electrostatic precipitator used in the chimney of a thermal power station? Explain

UNIT–II

3. Draw a neat schematic diagram of a hydroelectric plant and write the functions of various components.

OR

4. a) Explain the working of a gas power plant with a schematic diagram

   b) Explain the functions of the following
   (i) Reservoir (ii) Surge tank (iii) Spill ways

UNIT–III

5. Explain the basic components of a nuclear reactor with a neat diagram.

OR

6. What are merits and demerits of Nuclear Power Plants?

UNIT–IV

7. a) Discuss the objectives and requirement of tariff methods

   b) Define average load, maximum demand, load factor, diversity factor, plant use factor, load duration curve?

OR

8. Explain two part tariff and compare it with power factor tariff.

UNIT–V

9. What is biomass? What are the different sources used to extract biomass energy?

OR

10. Explain different types of Non- Conventional sources of energy?

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Hall Ticket Number :										

R-15

Code: 5G244

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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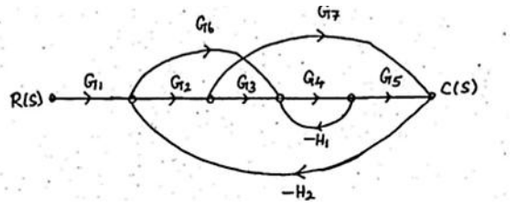
UNIT–I

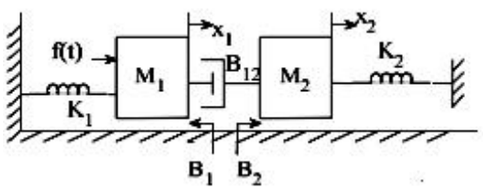
1. Deduce the block diagram of the given signal flow graph. Also find the transfer function using Mason's gain formula



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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