Hall Ticket Number :

**R-15**

**Code: 5GC41**

*II B.Tech. II Semester Regular Examinations May 2017*

# Complex Variables & 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 $\tan(x+iy)=A+iB$, show that $A^2+B^2+2A\cot 2x=1$ 7M

**OR**

2. a) Given that $\int_0^\infty \dfrac{x^{n-1}}{(1+x)}dx=\dfrac{®}{\sin n®}$ Show that $\Gamma(n)\Gamma(1-n)=\dfrac{®}{\sin n®}$ for $0<n<1$ and hence find $\Gamma\left(\dfrac{1}{4}\right)\Gamma\left(\dfrac{3}{4}\right)$ 7M

   b) Find the real and imaginary parts of $\ln\cos(x+iy)$. 7M

## UNIT–II

3. a) State and prove Cauchy-Reimann equations in Cartesian form. 7M

   b) If $v(r,¯)=\left(r-\dfrac{1}{r}\right)\sin¯,\ r\neq 0,$ then find an analytic function $f(z)=u+iv.$ 7M

**OR**

4. Determine an analytic function $f(z)=u+iv,$ if $u-v=\dfrac{\cos x+\sin x-e^{-y}}{2(\cos x-\cosh y)}$ and $f\left(\dfrac{®}{2}\right)=0.$ 14M

## UNIT–III

5. a) Evaluate $\int_c \dfrac{\cos® z}{z^2-1}dz$, using Cauchy's integral formula around a rectangle with vertices $2\pm i,-2\pm i$. 7M

   b) Expand $f(z)=\dfrac{(z-1)}{(z+1)}$ in Taylor's series about the point $z=1$. 7M

**OR**

6. a) Evaluate $\int_c |z|^2\,dz$ around the square with vertices at (0,0), (1,0), (1,1) (0,1) 8M

   b) Expand $f(z)=\dfrac{z}{(z-1)(z-3)}$ for $|z-1|<2.$ 6M

**UNIT–IV**

7. a) Using Cauchy's residue theorem, evaluate $\int_c \frac{e^{2z}}{(z+1)^4}\,dz$, where c is the circle $|z|=2$ 7M

b) Use Rouche's theorem to solve $p(z)=z^4-5z+1$, annulus region $1<|z|<2$. 7M

**OR**

8. a) Evaluate $\int_c \frac{(z-3)}{z^2+2z+5}\,dz$, where c is the circle $|z+(1+i)|=2$. 7M

b) Evaluate $\int_c \frac{f'(z)}{f(z)}\,dz$ where $f(z)=\frac{(z^2+1)^2}{(z^2+2z+2)^3}$, $c:|z|=4$ 7M

**UNIT–V**

9. a) Show that the straight lines parallel to the co-ordinate axes in the z-plane maps onto parabolas in the w-plane under the transformation $w=z^2$. Indicate the region with sketches. 7M

b) Find the bilinear transformation which maps $z=1,\ i\ ,-1$ into $w=0,1,\infty$ Also find the fixed points of the transformation. 7M

**OR**

10. a) Show that the transformation $w=\frac{i(1-z)}{(1+z)}$ maps the circle $|z|=1$ into the real axis of the w-plane and the interior of the circle $|z|<1$ into the upper half of the w-plane. 7M

b) Find the bilinear transformation which maps the points $z=-1,\ i\ ,1$ into $w=1,\ i,\ -1$. Also find its invariant points. 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code:** **5G242**

*II B.Tech. II Semester Regular Examinations May 2017*

# Electrical Circuits-II

( Electrical & 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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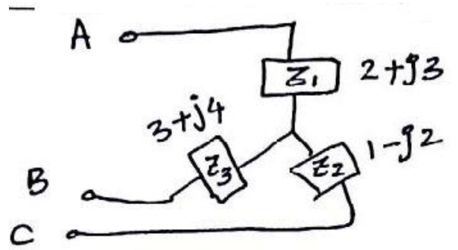
## UNIT–I

1. a) Convert into Delta connection equivalent.




4M

b) A balanced star connected load of $(4 + j3)\Omega$ per phase is connected to 400V supply. Calculate line currents, line voltages, phase currents, phase voltages using RYB sequence. Also find total power in the load? 10M

**OR**

2. a) Prove that $I_L = \sqrt{3}\, I_{Ph}$ in delta connected system. 4M

b) Prove that using 2 wattmeters we can find the total power in the 3phase load. 10M

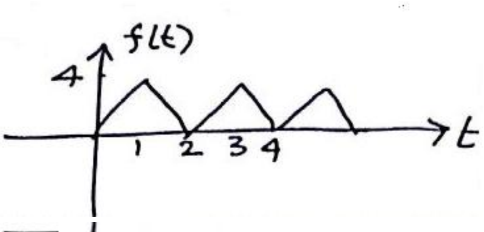
## UNIT–II

3. a) State and prove Time integration property of Laplace transform. 7M

b) $10\frac{d^2y}{dt^2} - 5\frac{dy}{dt} + y(t) = 4u(t)$. Find y(t) using Laplace transform.

**OR**

4. a) Find the Laplace transform of given periodic waveform.

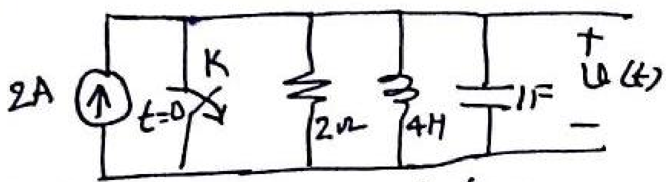



7M

b) $H(S) = \frac{10}{S(S^2+2S+9)}$. Find unit step response.

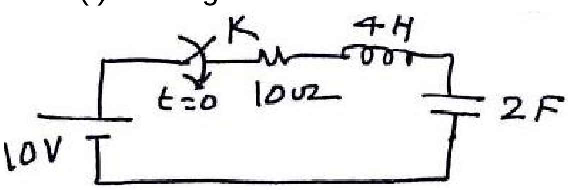
## UNIT–III

5. a) Find v(t) of the given parallel RLC circuit using Laplace transform for t>0




Switch K opened at t=0 7M

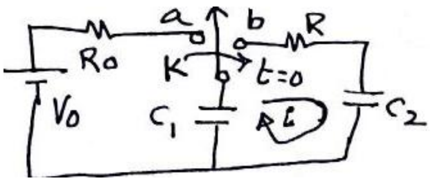
b) Find i(t) of the given series RLC circuit for t >0




7M

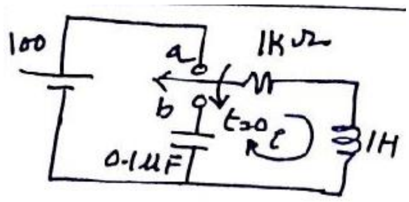
**OR**

6. a) Switch 'k' is connected to 'a' until it reaches steady state and moved to 'b' at t=0. Find i(t) for t > 0




7M

b) Find $\frac{di}{dt}(0+)$ when switch k is moved to 'b' at t=0.




7M

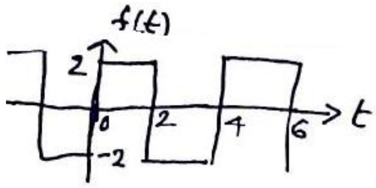
**UNIT–IV**

7. a) Explain all symmetry properties of wave form. 7M

b) $F.T.[f(t+4-2t)]$ using properties

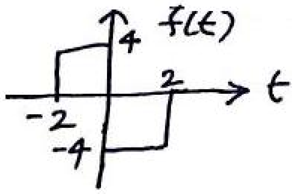
**OR**

8. a) Find trigonometric Fourier series using symmetry properties




7M

b)

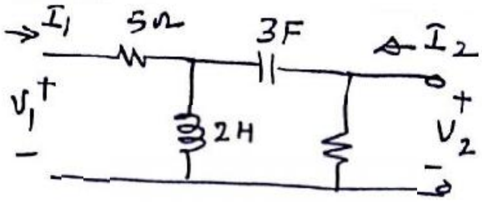



Find F(w)

**UNIT–V**

9. a) What are the properties of RC Network? 7M

b)




Find $\frac{I_2(S)}{V_1(S)}$

7M

**OR**

10. a) What are the necessary conditions for driving point function? 7M

b) $Z(S) = \frac{S^3+2S}{S^2+1}$. Implement using cauer form-I.

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G345**

*II B.Tech. II Semester Regular Examinations May 2017*

# 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 a CE Amplifier with $R_E$ un bypassed and determine $R_i$ , $R_o$, $A_v$ and $A_i$. 8M

   b) For a CB configuration, with $R_E$=2.2KΩ, $R_C$=3.3KΩ, $V_{EE}$=4V, $V_{CC}$=10V. The small-signal parameters are $h_{fb}$=0.99,$h_{ib}$=14.3Ω and $h_{ob}$=0.5μA/V. Calculate the values of $R_i$, $R_o$, $A_V$ and $A_i$. 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 the hybrid-π model for a transistor in the CE configuration and derive all the components in terms of h parameters. 14M

**OR**

4. a) Prove that in a pnp transistor operating in the active region, the diffusion capacitance $C_{De}$ at the emitter junction equals to $g_m$* W2/2$D_B$. 8M

   b) Define and obtain the expression for $f_T$ of CE Amplifier. 6M

## UNIT–III

5. a) List the advantages of negative feedback. 4M

   b) Describe the four types of feedback topologies. 10M

**OR**

6. a) Draw the circuit diagram of voltage-series feedback circuit and derive the expressions for input and output resistance. 8M

   b) Show that negative feedback improves the stability and reduces the non-linear distortion. 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) Classify Power Amplifiers. 6M

   b) Derive the expression for the Efficiency of a transformer coupled class A amplifier. 8M

**OR**

10. a) Explain the operation of a transformer coupled push-pull amplifier. 8M

    b) What is Harmonic Distortion? Derive the expression for THD. 6M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G241**

*II B.Tech. II Semester Regular Examinations May 2017*

# 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) Discuss the constructional details of a 1-Φ Transformer. 7M

   b) Explain the principle of operation of a transformer. Derive its EMF equation. 7M

**OR**

2. a) Explain the different types of transformers. 7M

   b) A single phase transformer has 180 turns respectively in its Secondary and primary windings. The respective resistances are 0.233 and 0.067. Calculate the equivalent resistance of i) the primary in terms of the secondary winding ii) the secondary in terms of the primary winding iii) the total resistance of the transformer in terms of the primary 7M

## UNIT–II

3. Develop the equivalent circuit of a single phase transformer referred to primary and secondary 14M

**OR**

4. a) Explain the OC & SC tests on 1-Φ Transformer. 7M

   b) The parameters of approximate equivalent circuit of a 4KVA,200/400V,50Hz single phase transformer are R’p=0.15Ω; X’p=0.37Ω;Ro=600Ω;Xm=300Ω when a rated voltage of 200V ia applied to the primary, a current of 10A at lagging power factor of 0.8 flows in the secondary winding. Identify

   (i)The current in the primary, Ip

   (ii)The terminal voltage at the secondary side 7M

## UNIT–III

5. Describe the various three phase transformer connection and parallel operation of three phase transformer. 14M

**OR**

6. a) Write short notes on three winding transformer. 7M

   b) With the help of connection and vector diagrams how a 2-Φ supply can be obtained from 3-Φ supply. 7M

## UNIT–IV

7. a) Explain the principle of operation of three-phase induction motor. 7M

   b) Prove that rotor copper loss is slip times air gap power. 7M

**OR**

8. a) The r.m.s. current in the rotor bars of an induction motor running with a slip of 1% is 25 A, and the torque produced is 20 N m. Estimate the rotor current and torque when the load is increased so that the motor slip is 3%. 7M

   b) As the slip of an induction motor increase, the current in the rotor increases, but beyond a certain slip the torque begins to fall. Why is this Explain? 7M

## UNIT–V

9. Describe the starting methods of three phase induction motor. 14M

**OR**

10. The test data on a 208 V, 60 Hz, 4 pole, star connected three-phase induction motor rated at 1710 rpm are as follows: the stator resistance between any two terminals = 2.4 Q. No load test: 450 W, 1.562 A, 208 V. Blocked rotor test: 59.4 W, 2.77 A, 27 V. Friction and windage loss = 18 W. Using circle diagram determine the stator current, power factor and efficiency at 75% full load. 14M

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| Hall Ticket Number : | | | | | | | | | | |
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**Code: 5G243**

**R-15**

*II B.Tech. II Semester Regular Examinations May 2017*

# 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. a) Explain about the growth of power systems in India? 7M
   b) What is the function of electrostatic precipitator used in the chimney of a thermal power station? Explain. 7M

**OR**

2. Draw the line diagram of a thermal power station showing various parts 14M

## UNIT–II

3. a) Explain the working of a gas power plant with a schematic diagram 7M
   b) With neat sketch explain the function of pumped storage plants. 7M

**OR**

4. Draw a neat schematic diagram of a Hydro Electric Plant and explain the functions of various components? 14M

## UNIT–III

5. a) What are merits and demerits of Nuclear Power Plants? 7M
   b) Explain the working principle of a nuclear power plant with a schematic diagram. 7M

**OR**

6. What are the factors to be considered for the selection of site of a nuclear power station? 14M

## UNIT–IV

7. a) A Power station has a maximum demand of 12MW, a load factor of 60%, plant capacity factor of 50% and plant use factor of 72%. Find
      i) Reserve capacity
      ii) Maximum energy that could be produced daily if the plant while running as per schedule were fully loaded. 7M
   b) Explain different types of power factor tariff? 7M

**OR**

8. a) List out the types of tariff used in practice. Distinguish by suitable examples between
      (i) two-part tariff and
      (ii) Maximum demand tariff. 14M

## UNIT–V

9. Explain different types of Non- Conventional sources of energy? 14M

**OR**

10. Explain about:
    a) Solar distillation.
    b) Solar cooling.
    c) Solar drying. 14M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G244**

*II B.Tech. II Semester Regular Examinations May 2017*

# 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. a) Define Signal flow graph. Why do we choose SFG over block reduction techniques? State the advantages of SFG. Explain Mason's gain formula. 7M

   b) Draw the signal flow graph for the following equations

   $x_2 + 5x_3 - 2x_1 = 0$

   $x_3 + 2x_4 - 4x_2 = 0$

   $x_4 - 8x_3 = 0$ 7M

**OR**

2. Define control system. State the difference between closed loop and open control system with examples. Define transfer function. Find the transfer function of closed loop control system. 14M

## UNIT–II

3. a) What is the output response of second order control system subjected to unit step input function? 7M

   b) Obtain the rise time , peak time, maximum peak overshoot and settling time of the unit step response of a closed loop control system given by

   $$\frac{C(s)}{R(s)} = \frac{36}{S^2 + 2S + 36}$$ 7M

**OR**

4. a) A feedback control system is represented by the closed loop transfer function given by the $\frac{C(s)}{R(s)} = \frac{9}{S^2 + 0.6S + 9}$ .Find Kp, $K_v$, $K_a$ , For the system and the steady state error for r(t)=1+t+($t^2$)/2. 7M

   b) Define Type of the system. Find the position, velocity and acceleration error co-efficient for standard input signals. 7M

## UNIT–III

5. a) Write the limitations of R-H criterion. Using Routh criterion investigate the stability of unity feedback control system whose open loop transfer is given by $G(s) = \frac{e^{-sT}}{s(s+2)}$ . 7M

   b) The open loop transfer function of a feedback control system is given by $G(s)H(s) = \frac{K}{s(s+4)(s^2+2s+2)}$ . Determine the stability of the system when K=12 and find the range of K for stability. 7M

**OR**

6. a) Draw the root locus for the unity feedback system whose open loop transfer function is $G(s) = \frac{k(s+1)}{(s-1)(s+2)(s+4)}$ . Find the range of k for which the system is stable. 14M

**UNIT–IV**

7. a) Sketch the Bode plot for the open-loop transfer function for the unity feedback system given below and assess stability $G(s)H(s)=\dfrac{50}{(s+1)(s+2)}$. 7M

   b) Define minimum, non-minimum and all pass transfer function. Explain the effect of transportation lag in Bode plot. 7M

**OR**

8. a) Sketch the polar plot for the system with open loop transfer function $G(s)H(s)=\dfrac{1}{(s+2)(s+4)}$. 7M

   b) Define PM, GM, PCF and GCF showing in graph. How are these parameters related to stability? 7M

**UNIT–V**

9. The open-loop transfer function of a unity feedback control system is given by $G(s)H(s)=\dfrac{K}{s(1+0.2s)}$. Design a suitable compensator such that the system will have $K_v$ and PM = $50^0$ . 14M

**OR**

10. a) Define transfer function. Find the transfer function of MIMO system is $G(s)=C(sI-A)^{-1}B+D.$ 7M

    b) Find the resolvent matrix of $A=\begin{bmatrix}1 & 4\\ -2 & -5\end{bmatrix}$. 7M

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