

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
(AUTONOMOUS)**

**II B.Tech. I-Semester Regular Examinations, November 2012  
Electrical Circuit Theory  
(ECE)**

Max. Marks: 70

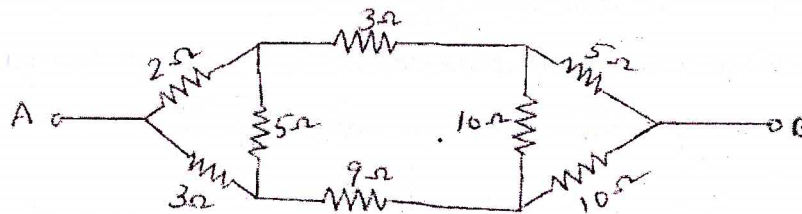
Time: 03 Hours

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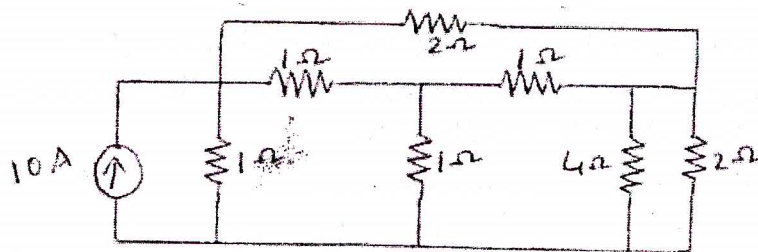
Answer any five questions

All Questions carry equal marks (14 Marks each)

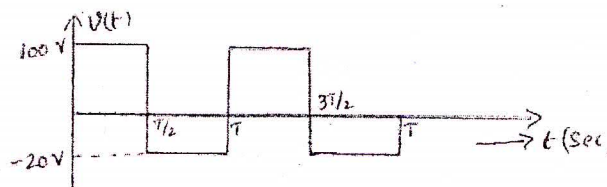
1. a) Write a note on resistance and V-I relationship with suitable examples. 6M  
 b) Find the equivalent resistance between the terminals A & B for the figure shown below. 8M



2. a) Define the following 6M  
 i. path      ii. Node      iii. Super Node.  
 b) For the circuit shown in figure determine the node voltages. 8M

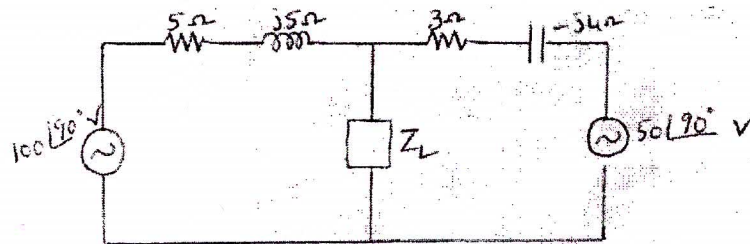


3. a) Define the following 6M  
 i. Cycle.      ii. Frequency      iii. Form factor  
 b) Find the form factor and peak factor for the given wave form. 8M

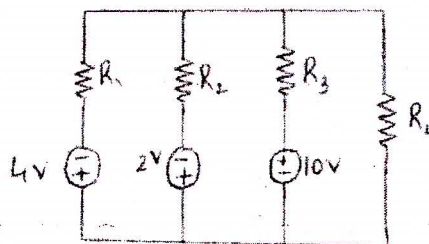


4. a) Define the following 6M  
 i. Resonance.      ii. Bandwidth      iii. Quality factor.  
 b) A series R-L-C circuit of  $100\Omega$  resistor and an inductor of  $0.318$  H and a capacitor of unknown value. This circuit is supplied by  $230$  V,  $50$  Hz supply and draws a current of  $2.3$  A and the current is in phase with the supply voltage. Find the value of capacitance and the power supplied by the source. 8M

5. a) Derive the expression for wattmeter readings in two wattmeter method with balanced star-connected load. How do you calculate the power factor of the balanced load from wattmeter readings? 6M
- b) A 400V, 3- $\phi$  supply feeds an unbalanced 3-wire star-connected load, having impedances of  $4 + j8\Omega$  and  $15 + j20\Omega$  respectively. Find the line currents and voltages across each impedance and total power consumed in the circuit. 8M
6. a) A non-magnetic core has the core length of 100cm and its cross sectional area is  $20\text{cm}^2$ . It carries a coil of 500 turns. Find its self inductance. 6M
- b) Two coupled coils with self inductances of 0.4H and 0.9H are coupled with 50% of coupling. Find the effective inductance of the coils in the following cases.  
i. Series aiding.      ii. Series opposing. 8M
7. a) Find the maximum power transferred to the load ' $Z_L$ ' of network shown in figure. 6M



- b) State and explain Norton's theorem with suitable example. 8M
8. a. State and explain reciprocity theorem with suitable example. 6M
- b. Using Milliman's theorem find the current through  $R_L$  in the circuit shown below. Given that  $R_1 = R_2 = R_3 = 4\Omega$  and  $R_L = 10\Omega$ .



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***Electronic Circuits***

**( ECE )**

**Max. Marks: 70**

**Time: 03 Hours**

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**Answer any five questions**

**All Questions carry equal marks (14 Marks each)**

1. a) Give the classification of amplifiers according to frequency and applications. 4M  
b) Define and prove Millers theorem 10M
2. a) Write short notes on choice of transistor configuration in a cascade amplifiers 4M  
b) Derive the expression for  $A_i$ ,  $A_v$ ,  $R_i$ ,  $R_o$  of two-stage RC coupled CE amplifiers 10M
3. a) What are the effects of various capacitors on frequency response 4M  
b) Find  $r_{b'e}$ ,  $r_{bb'}$ ,  $g_m$  and  $f_H$  for  $R_L=1K\Omega$  of a BJT amplifier having  $h_{ie}=3K\Omega$ ,  $h_{fe}=100$ ,  $f_T=4MHz$ ,  $C_c=2pF$  and  $C_e=18pf$  measured at  $I_c=1mA$ . 10M
4. a) Write the advantages and disadvantages of negative feedback 4M  
b) Derive the expressions for  $A_v$ ,  $R_i$ ,  $R_o$ ,  $A_i$  of voltage series feedback amplifier 10M
5. a) Explain barkhausen criterion in oscillator circuits. 4M  
b) In a transistorized Hartley oscillator the two inductances are 2 mH and 2  $\mu H$  if the frequency changed from 950 kHz to 1050 kHz calculate the change in capacitor. 10M
6. a) List the features of power amplifiers. 4M  
b) A class B push pull amplifier drives a load of  $16\Omega$ , connected to the secondary of the ideal transformer. the supply voltage is 25v. if the number of turns on the primary is 200 and the number of turns on the secondary is 50, calculate maximum power output, d.c power input, efficiency and maximum dissipation per transistor. 10M
7. a) Classify tuned amplifier depending on coupling used. 4M  
b) Explain how the stability is obtained in tuned amplifiers. 10M
8. a) List three terminal voltage regulator series and their output voltages 4M  
b) Explain shunt voltage regulator with suitable diagram 10M

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
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**II B.Tech. I-Semester Regular Examinations, November 2012**

**ENGINEERING MATHEMATICS**

**(Common to EEE and ECE)**

Max. Marks: 70

Time: 03 Hours

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Answer any five questions

All Questions carry equal marks (14 Marks each)

1. a. Test for consistency and solve

$$5x + 3y + 7z = 4, \quad 3x + 26y + 2z = 9, \quad 7x + 2y + 10z = 5$$

- b. Find the Eigen values and Eigen vectors of the matrix  $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$

2. a. Using the bisection method, find the negative root of the equation  $x^2 - 4x + 9 = 0$

- b. Solve by Taylor's series method the equation  $\frac{dy}{dx} = \log(xy)$  for  $y(1.1)$  and  $y(1.2)$  given  $y(1) = 2$   $\frac{dy}{dx} = x + y$  and  $y = 1$  when  $x = 0$

3. a. Calculate the rank correlation for the following data

x:	56	42	72	36	63	47	55	49	38	42	68	60
y:	147	125	160	116	149	128	150	145	115	140	152	155

- b. Fit a parabola  $y = a + bx + cx^2$  to the following data

x:	2	3	6	8	10
y:	3.07	12.85	31.47	57.38	91.29

4. a. Find the differential equation by eliminating arbitrary functions from  $u = f(x^2 + 2yz, y^2 + 2zx)$

- b. Solve the partial differential equation  $z = pqxy$  using Charpit's method.

5. a. Find the Fourier series to represent  $f(x) = \pi x$  in  $0 \leq x \leq 2$

- b. Express  $f(x) = x$  as a half range sine series in  $0 < x < 2$

6. Find Fourier transform of i.  $e^{-2(x-3)^2}$  ii.  $e^{-x^2} \cos 3x$

7. a. The number of divorces per 1000 marriages in the United States increased from 84 in 1970 to 108 in 1990. Find the annual increase of the divorce rate for the period 1970 to 1990

- b. A variate X has the probability distribution

X:	-3	6	9
P(X=x)	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

Find  $E(X)$  and  $E(X^2)$

8. a. If the probability of a bad reaction from certain injection is 0.001 determine the chance that out of 2,000 individuals more than two will get a bad reaction.

- b. Fit a normal curve to the following distribution.

x:	2	4	6	8	10
f:	1	4	6	4	1

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
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**II B.Tech. I-Semester Regular Examinations, November 2012**

***Environmental Science*  
(Common to ECE & IT)**

**Max. Marks: 70**

**Time: 03 Hours**

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**Answer any five questions**

**All Questions carry equal marks (14 Marks each)**

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|-------|--|-----|
| 1. a) | Discuss the major environmental problems of global concern.                  | 10M |
| b)    | Explain the components of environment.                                       | 04M |
| 2. a) | Write a short note on over exploitation of forests.                          | 07M |
| b)    | Explain the causes and effects of drought.                                   | 07M |
| 3.    | Explain the role of an individual in conservation of natural resources.      | 14M |
| 4. a) | Explain various disposal methods of solid waste.                             | 09M |
| b)    | Discuss about radiation pollution in India.                                  | 05M |
| 5. a) | Define ecological succession. Describe the process of ecological succession. | 08M |
| b)    | Describe in detail about food chain and food web.                            | 06M |
| 6. a) | Enumerate the main biogeographical zones in India.                           | 07M |
| b)    | Discuss the classification of biodiversity.                                  | 07M |
| 7. a) | Write a short note on resettlement and rehabilitation of people.             | 06M |
| b)    | Explain briefly about forest conservation act.                               | 08M |
| 8.    | Explain the role of information technology in environment and human health.  | 14M |

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**II B.Tech. I-Semester Regular Examinations, November 2012**

***Pulse and Digital Circuits***

**( ECE )**

**Max. Marks: 70**

**Time: 03 Hours**

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**Answer any five questions**

**All Questions carry equal marks (14 Marks each)**

1. a. Derive the expression for percentage tilt P of a square wave output of a RC high pass circuit. 7
- b. An ideal  $1\mu\text{S}$  pulse is fed to an amplifier. Calculate and plot the output wave form under the following conditions. The upper 3 dB frequency is:
  - i) 10MHz    ii) 1MHz 7
2. a. With the help of neat circuit explain the working of negative clamping circuit. What is the effect of  $R_s$  and  $R_f$  in the output wave form? 7
- b. With the help of necessary circuit and waveforms explain the transistor clipper. 7
3. a. Explain the storage and transition times of the diode as switch. 7
- b. Explain the phenomenon of latching in a transistor. 7
4. a. Draw the circuit diagram of Schmitt trigger and explain its operation? Derive the expression for UTP and LTP. 7
- b. Explain the symmetrical and unsymmetrical triggering of bistable multivibrator. 7
5. a. Give the comparison of Miller and bootstrap sweep generators. 7
- b. Derive the expression for slope error and sweep error for the bootstrap sweep circuit. 7
6. a. Explain the basic operating principles of sampling gates. 7
- b. With neat circuit explain the operation of bidirectional sampling gate using transistor. 7
7. a. Explain how monostable relaxation circuits act as a divider. 7
- b. Explain the synchronization of a sweep generator with pulse synchronization. 7
8. a. a) Explain the operation of a NAND gate with the help of circuit diagram. 7
- b. b) Construct a AND gate from a basic DTL gate and explain its circuit diagram. 7

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Answer any five questions

All Questions carry equal marks (14 Marks each)

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1. *a.* Define probability and its Axioms? [4M]
- b.* In a box there are 500 colored balls: 75 black, 150 green, 175 red, 70 white and 30 blue. What are the probabilities of selecting each ball? [3M]
- c.* Define Conditional density function and list out its properties? Is  $f_X(x) = ae^{-|x-m|/b}$  where  $a, b, m$  are real constants and  $b > 0$  a valid Density function? [7M]
2. *a.* Define an Expected value and Expected value of a function of a RV for Discrete and Continuous RV's? [4M]
- b.* Prove (i)  $m_0 = 1$  (ii)  $\mu_0 = 1$  (iii)  $\mu_1 = 0$  for any function  $f_X(x)$ ? [3M]
- c.* Obtain Moment generating function for the given density function  $f_X(x) = ae^{-ax}u(x)$ ;  $a > 0$ . Thus find (i)  $m_0$  (ii)  $m_1$  (iii)  $\mu_2$  (iv)  $\mu_3$  [7M]
3. *a.* Discuss Central Limit theorem for equal and unequal distributions? [7M]
- b.* Let  $X$  and  $Y$  be statistically independent RV's with  $\bar{X} = 3/4, \bar{X}^2 = 4, Y = 1$  and  $\bar{Y}^2 = 5$ . For an RV  $W = X - 2Y + 1$  find (i)  $R_{XY}$  (ii)  $R_{XW}$  (iii)  $R_{YW}$  (iv)  $C_{XY}$  (v) Are  $X$  and  $Y$  uncorrelated? [7M]
4. *a.* Explain about Power density spectrum, average power and Cross-Power density spectrum of System response? [7M]
- b.* A random process  $X(t)$  is applied to the network with impulse response  $h(t) = u(t) \exp(-bt)$  where  $b > 0$  is a constant. The cross correlation of  $X(t)$  with output  $Y(t)$  is  $R_{XX}(\tau) \tau \exp(-b\tau)$ . (i) Find the auto correlation of  $X(t)$  (ii) Find the auto correlation of  $X(t)$  (iii) What is average power in  $Y(t)$ ? [7M]
5. *a.* When a process is said to Band limited? List out the properties of Band limited process? [7M]
- b.* A system's power transfer function is  $|H(\omega)|^2 = 16/[256 + \omega^4]$  (i) find its noise B.W (ii) find  $\omega_0$  (iii) white noise with power density  $6(10^{-3})$  W/Hz is applied to the input, find noise power in the system's output? [7M]
6. *a.* Explain in detail about Mean Ergodic Processes? [7M]
- b.* Assume that an Ergodic random process  $X(t)$  has an autocorrelation function  $R_{XX}(\tau) = 18 + [2/(6 + \tau^2)][1 + 4\cos(12\tau)]$ . (i) Find  $|\bar{X}|$  (ii) what is average power in  $X(t)$  [7M]
7. *a.* Define Cross correlation function? And explain about its properties? [7M]
- b.* Define a RP by  $X(t) = A \cos(\pi t)$  where  $A$  is a Gaussian RV with zero mean and variance  $\sigma_A^2$ . (i) Find the density function of  $X(0)$  and  $X(1)$ . (ii) Is  $X(t)$  stationary in any sense? [7M]
8. *a.* Explain Relationship between Cross-Power spectrum and Cross-Correlation function [7M]
- b.* Find Power density spectrum and average power of the RP  $X(t) = A_0 \cos(\omega_0 t + \theta)$  where  $A_0$  and  $\omega_0$  are real constants and  $\theta$  is a RV uniformly distributed on the interval  $(0, \pi/2)$ ? [7M]

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