

**II B.Tech I Semester Supplementary Examinations April/May – 2013**  
**Electrical Circuit Theory**  
(ECE)

Max. Marks: 70

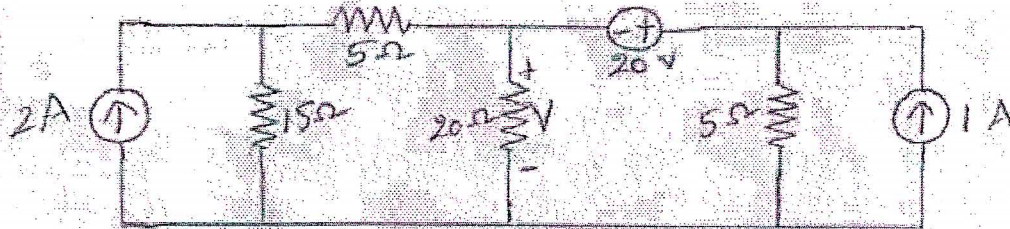
Time: 03 Hours

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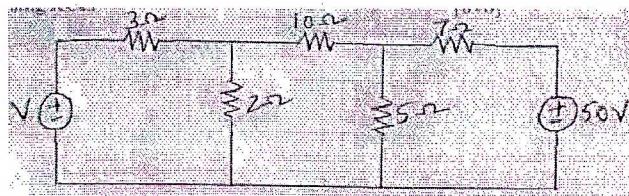
Answer any five questions

All Questions carry equal marks (14 Marks each)

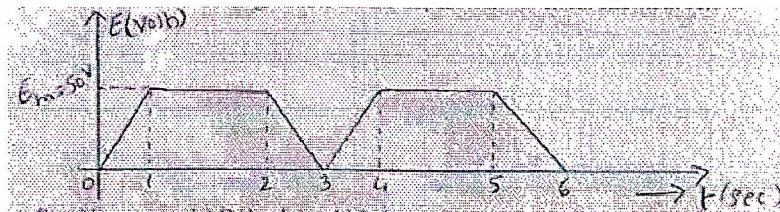
1. a) State and explain Kirchoff's Laws. 6M  
 b) Using source transformation technique. Find 'V' given figure below. 8M



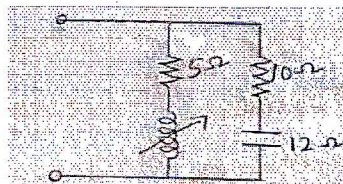
2. a) Find the voltage 'V' in the circuit shown which makes the current in the 10Ω resistor is zero. Using KCL. 8M



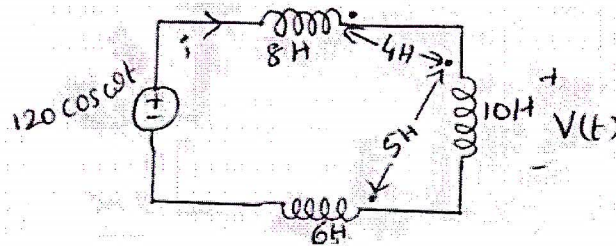
- b) Define the following terms 6M  
 i. Node      ii. Loop      iii. Branch
3. a) Derive the RMS and Average values for sinusoidal voltage waveform over a time period 't' for 1-cycle. 7M  
 b) Find the RMS and Average values for the trapezoidal waveform shown below. 7M



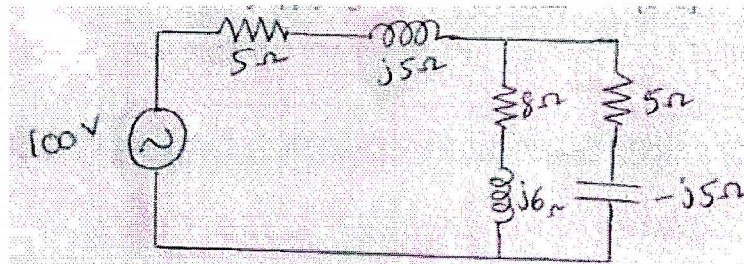
4. a) Consider a general AC circuit in which the current leads the applied voltage by an angle  $\phi$ . Write the equation for the voltage and current and hence derive the equation for the power. Also plot the voltage and current waveforms. 6M  
 b) Find the value of inductance at which the circuit resonates at an angular frequency of 1000 radians/seconds in the circuit shown in figure. 8M



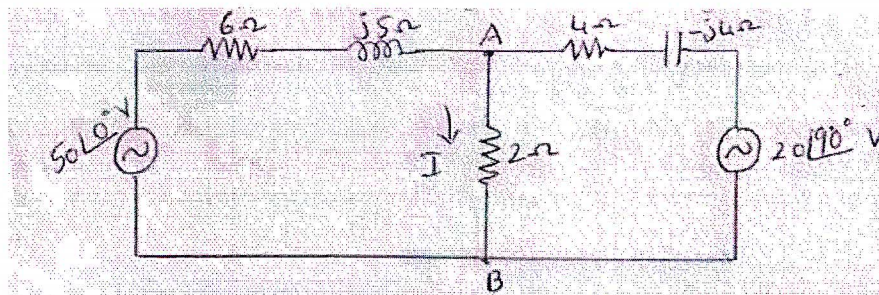
5. a) Derive the relationship between phase and line quantities of voltage and current for balanced star-connected load. 7M
- b) Three star connected impedance  $Z_a = 20\angle 0^\circ \Omega$ ,  $Z_b = 20\angle -30^\circ \Omega$  and  $Z_c = 20\angle 30^\circ \Omega$  are fed by a 3 wire 400V supply. Determine the line currents and power input to the load using star to delta transformation. 7M
6. a) Derive the expression for coefficient of coupling. 7M
- b) For the circuit shown in figure. Find  $V(t)$ . 7M



7. a) Determine the current through the load impedance  $Z_L = 8 + j6 \Omega$  connected across AB in the network shown by applying Norton's theorem. 8M



- b) Derive the condition for maximum power transfer. 6M
8. a) State and verify Tellegen's theorem. 6M
- b) Using Milliman's theorem find the current through  $2\Omega$  resistance in the figure shown. 8M



**II B.Tech I Semester Supplementary Examinations April/May – 2013  
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) Write short notes on distortion in amplifiers 4M  
 b) Derive  $A_i$ ,  $A_v$ ,  $R_i$ ,  $R_o$  for CC configuration 10M
2. a) Write short notes on coupling schemes in amplifiers 4M  
 b) Explain the cascode amplifier with suitable circuit diagram. 10M
3. a) Why the gain of the amplifiers decreases in the low and high frequency ranges. 4M  
 b) Find source resistance and mid-band gain of a single stage CE amplifier having voltage gain bandwidth  $f_H$  of 5MHz with  $R_L=500\Omega$  assume  $h_{fe}=100$ ,  $g_m=100\text{mA/v}$ ,  $r_{bb}=100\Omega$ ,  $C_c=1\text{pF}$  and  $f_T=400\text{MHz}$ . 10M
4. a) Give the differences between different feedback amplifiers 4M  
 b) If an amplifier has a bandwidth of 200KHz and voltage gain of 100  
     i) Find the new bandwidth and gain if 08% negative feedback is introduced  
     ii) Find the amount of feed back if the bandwidth is to be limited to 500kHz. 10M
5. a) Write short notes on LC tank circuit operation 6M  
 b) Derive the frequency expression of Colpitts oscillator. 8M
6. a) Compare small signal and large signal amplifiers 4M  
 b) Design a class A transformer coupled amplifier using a BJT to deliver 100 mW of audio power into  $8\Omega$  load. At the operating point  $I_B=250\mu\text{A}$ ,  $V_{cc}=16\text{V}$ .the collector dissipation should not exceed 200mW. $R'_L=1\text{K}\Omega$ . 10M
7. a) What is the importance of Q-factor in tuned amplifiers. 4M  
 b) Explain the effect of cascading single tuned amplifiers on bandwidth. 10M
8. With neat sketch explain 723 voltage regulator 14M

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

II B.Tech I-Semester Supplementary Examinations Apr/May 2013.

**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. If the following system has non-trivial solution, prove that

$$a + b + c = 0 \text{ or } a = b = c : ax + by + cz = 0, bx + cy + az = 0, cx + ay + bz = 0$$

- b. Find the Eigen values and Eigen vectors of the matrix  $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

2. a. Use the method of false position, to find the fourth root of 32 correct to three decimal places.

- b. Using Euler's method, find an approximate value of y corresponding to x=1, given that

3. a. Find the correlation coefficient between x and y from the given data:

x:	78	89	97	69	59	79	68	57
y:	125	137	156	112	107	138	123	108

- b. By the method of least squares, find the straight line that best fits the following data.

x:	1	2	3	4	5
y:	14	27	40	55	68

4. a. Find the differential equation of all planes which are at a constant distance from the origin.

- b. Solve the partial differential equation  $p(p^2 + 1) + (b - z)q = 0$  using Charpit's method.

5. a. Find the Fourier series to represent  $x^2$  in the interval  $(-l, l)$ .

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

6. Find the Fourier transform of  $e^{-a^2x^2}$ ,  $a < 0$ . Hence deduce that  $e^{-x^2/2}$  is self reciprocal of Fourier transform.

7. a. An aeroplane filed along the four sides of a square at speeds of 100,200, 300 and 400 km/hr respectively. What is the average speed of the plane in its flight around the square.

- b. A variate X has the probability distribution

X:	-3	6	9
P(X=x)	1/6	1/2	1/3

Find E(X) and E(X<sup>2</sup>)

8. a. In 256 sets of 12 tosses of a coin, in how many cases one can expect 8 heads and 4 tails.

- b. Fit a Poisson distribution to the set of observations

x:	0	1	2	3	4
f:	122	60	15	2	1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
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**II B.Tech I Semester Supplementary Examinations April/May – 2013**

**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.    | Explain the need for public awareness on environmental issues.                                  | 14M |
| 2. a) | Discuss various types of natural resources and their associated problems.                       | 10M |
| b)    | What are the consequences of overdrawing of ground water.                                       | 04M |
| 3. a) | Discuss the environmental effects due to mineral extraction and usage.                          | 07M |
| b)    | Write a short note on land resources.   | 07M |
| 4. a) | Discuss the ecological and economic impacts of soil pollution.                                  | 08M |
| b)    | Explain the causes and effects of floods.   | 06M |
| 5.    | Explain briefly about the structure, characteristic features and functions of desert ecosystem. | 14M |
| 6. a) | Discuss about biodiversity at global, national and local levels.                                | 10M |
| b)    | Write a short note on in-situ conservation.   | 04M |
| 7. a) | Discuss equitable use of resources for sustainable lifestyle.                                   | 07M |
| b)    | Explain the causes and effects of acid rain.  | 07M |
| 8. a) | Discuss the need and objectives of women and child welfare.                                     | 10M |
| b)    | Write a short on population growth.   | 04M |

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**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
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**II B.Tech I Semester Supplementary Examinations April/May – 2013  
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 output and draw the response of RC low pass circuit for square wave input. 7  
b. What is an attenuator? Explain the under and over compensation in attenuator. 7
2. a. Draw the voltage comparator response for ramp input. State the comparator applications. 7  
b. State and prove the clamping circuit theorem. 7
3. a. Write a short notes on:  
i) Diode switching times ii) Switching characteristics of transistor. 7  
b. Define the following:  
i) Storage time ii) Delay time iii) Rise time iv) Fall time 7
4. a. With neat circuit explain the operation of monostable multivibrator. Also sketch waveforms and derive the pulse width. 7  
b. Design a astable multivibrator with frequency 1KHz,  $h_{fe} = 50$ ,  $I_{c(sat)} = 5mA$ ,  $V_{CE(sat)} = 0.2V$ ,  $V_{CC} = 12V$ . Assume  $R_1 = R_2$ . 7
5. a. Draw the circuit of a constant current sweep circuit and derive the expression for sweep voltage. 7  
b. Draw and explain practical transistor acts as a current sweep. 7
6. a. With help of a neat diagram explain the working of two diode sampling gate. 7  
b. Distinguish between sampling gate and logic gate and give examples of each. 7
7. a. Explain the principle of synchronization and frequency division in blocking oscillator. 7  
b. Illustrate the factors which influence the stability of relaxation devices. 7
8. a. Draw and explain the circuit diagram of integrated positive DTL NAND gate. 7  
b. Realize two inputs TTL AND gate with truth table and explain its operation with neat sketch. 7

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
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**II B.Tech I Semester Supplementary Examinations April/May – 2013**  
**Random Variables and Random Processes**  
(ECE)

Max. Marks: 70

Time: 03 Hours

Answer any five questions

All Questions carry equal marks (14 Marks each)

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1. a. Define RV? Write down the conditions for a function to be a RV? [2M]
- b. Define Conditional Probability and prove Bayes' theorem? [5M]
- c. Define distribution function and list out its properties? Find probabilities  
(i)  $P\{X > 4\}$  (ii)  $P\{6 < X \leq 9\}$  for a distribution function  $F_X(x) = \sum_{n=1}^{12} \frac{n^2}{650} u(x - n)$ ? [7M]
2. a. Explain about Moments about origin, Moments about origin, Variance, Skew and Coefficient of skewness? [7M]
- b. Obtain characteristic 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. Explain point conditioning and interval conditioning of Conditional Distribution and Density functions? [7M]
- b. Two RV's X and Y have joint density function  
i) Find the Marginal density functions of X and Y  
ii) Are X and Y statistically independent? 
$$f_{X,Y}(x,y) = \begin{cases} \frac{5}{16}x^2y & 0 < y < x < 2 \\ 0 & \text{else where} \end{cases}$$
 [7M]
4. a. Discuss about Auto correlation function of a response and Cross-correlation function of Input and Output of Linear Systems? [7M]
- b. For a signal  $x(t) = L \frac{di}{dt} + y(t)$  find i) Power density spectrum of response  
ii) Average power of response and  
iii) Cross-Power density spectrum of input and Output (consider white noise)? [7M]
5. a. Obtain the expression of Noise BW for band pass transfer function? Find Noise BW for the given transfer function  $|H(\omega)|^2 = 1/[1+(\omega/W)^4]$ ? [7M]
- b. Discuss about Thermal noise source and Effective noise temperature? [7M]
6. a. Discuss about first order, second order and wide sense Stationarity processes? [7M]
- b. Find time average and time autocorrelation function of the RP  $X(t) = C$  where C is a discrete RV having possible values  $c_1=1$ ,  $c_2=2$ , and  $c_3=3$  occurring with probabilities 0.6, 0.3, and 0.1 respectively? [7M]

7. a. Define autocorrelation function? And explain about its properties? [7M]
- b. Statistically independent, zero-mean RP  $X(t), Y(t)$  have functions  $R_{XX}(\tau) = e^{-|\tau|}$  and  $R_{YY}(\tau) = \cos(2\pi\tau)$  respectively, Find Cross correlation of  $X(t)+Y(t)$  and  $X(t)-Y(t)$ ? [7M]
8. a. Explain about properties of Power density spectrum and its BW? [7M]
- b. Determine cross correlation function to the cross power spectrum given by  $6/[(9+\omega^2)(3+j\omega)^2]$ ? [7M]

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