Code No. 5089 / S

FACULTY OF ENGINEERING

B.E. 2/4 (EEE) II – Semester (Suppl.) Examination, January 2016

Subject : Electrical Circuits - II

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1	Explain the significance of Transient response in Electrical Circuits.	3
2	Obtain the current response of RL series circuit with Sinusoidal input.	4
3	Write the limitations of Transfer function.	3
4	Find the final value of $x(t) = e^{-t}(\sin 3t + \cos 5t)$.	3
5	Obtain the impulse response of RC series circuit.	3
6	Define Half-wave symmetry in Fourier series.	3
7	Write the concept of Poles and Zeros in Network functions.	3
8	Point out the difference in the philosophy between Foster and Cauer forms of synthesis.	3

PART – B (50 Marks)

9 The figure 1 shows the waveform of the current passing through an inductor of resistance 1Ω and inductance of 2H. Find the energy absorbed by the inductor in the first four seconds. 10

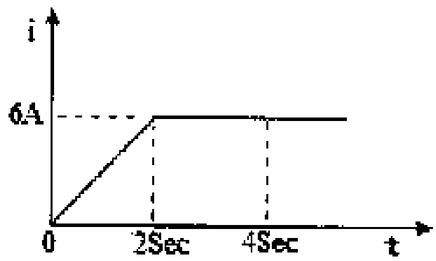

Fig. 1

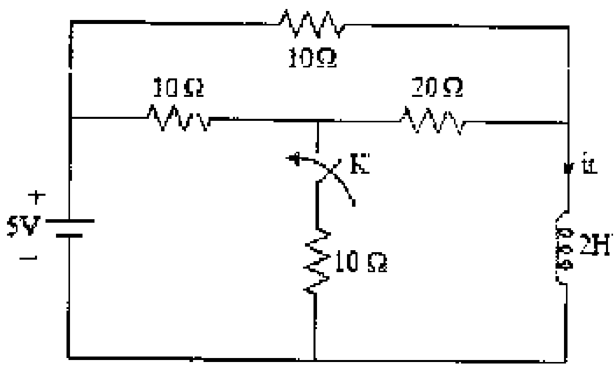

Fig. 2

10 In the network of the figure 2 the switch K is open and the network reaches a steady state. At t = 0 the switch K is closed. Find the current in the inductor for $t > 0$. 10

11 A ramp voltage 2r (t-2) is applied in a series RC circuit at t = 0 where $R = 3\Omega$ and C = 1F. Assuming zero initial conditions, Find i(t). 10

..2

12 Explain how time domain response of a circuit can be determined from s-plane plot of the poles and zeros of its network function and from the transfer of the network sources. 10

13 a) Find the Fourier transform of the following functions. 6

i) sin (3t + 60) ii) u(t+3)

b) State and explain complex Translational theorem. 4

14 a) Find the range of 'a' in P(s) so that the given polynomial is Hurwitz. 5

$$P(s) = 2s^4 + s^3 + as^2 + s + 2$$

b) State and prove all the properties of Hurwitz Polynomials. 5

15 Synthesis the network function $Z(s) = \frac{s(s^2+4)}{2(s^2+1)(s^2+3)}$ using Foster and Cauer forms of realization. 10

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Code No. 5096 / S

FACULTY OF ENGINEERING

B.E. 2/4 (Inst.) II - Semester (Suppl.) Examination, January 2016

Subject : Transducer Engineering

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1 Briefly explain the operation of temperature compensation in a wheat stone bridge. (3)
2 How very minute displacements can be measured ? What is the transducer to be used? (2)
3 Differentiate between active and passive transducers. (3)
4 Explain the operation of RTD. (2)
5 What is over damping? When does it occur? (2)
6 Mention the characteristics of flat type diaphragms. (2)
7 List the advantages of LVDT. (3)
8 Briefly explain how temperature compensation is achieved with SGS in a wheat stone bridge. (3)
9 What is magneto restrictive effect? (2)
10 What is a thermopile? (3)

PART – B (50 Marks)

11 Define the following with reference to transducer
(i) Non-conformity error
(ii) Dynamic error
(iii) Sensitivity error

12 (a) Explain with diagrams, the bonded and unbonded types of strain gauge.
For bonded strain gauges, describe the materials used for base, and adhesive materials and also the materials used for leads.
(b) A resistance wire strain gauge having a nominal resistance of 350 ohms is subjected to a strain of 500 micro strain. Find the change in the value of resistance neglecting the piezoelectric effect.

13 Draw and describe the following for thermistors.
(i) Resistance – temperature characteristics
(ii) Voltage – current characteristics
(iii) Current – time characteristics

14 (a) Describe the method for measurement of temperature with use of
(i) RTDs
(ii) Thermocouples
(iii) IC sensors

Describe their advantages and limitations.

15 (a) Give a overview of the inductive transducers explaining their principle of operation like variation of number of terms, geometric configuration and permeability. Draw neat sketches to show the above effects.

(b) An LVDT with a secondary voltage of 5V has a range of $\pm$ 25mm and find the output voltage when the core is -18.75 mm from the center.

16 (a) Explain the different principles of working of capacitive transducers.

(b) Two plates of parallel plate capacitive transducer are 30mm apart and the space is filled with the different dielectric materials, one material is 1 cm thick with a dielectric constant of 5 and the other material is 20 mm thick with a dielectric constant 10. If the capacitive transducers were to be made up of a single dielectric material, what is the dielectric constant of the material.

17 Write short notes on:

(a) Bellows

(b) Thermal conductivity gauge

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Code No. 5098 / S

FACULTY OF ENGINEERING

B.E. 2/4 (ECE/M/P/AE/CSE) II – Semester (Suppl.) Examination, January 2016

Subject : Mathematics - IV

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 Show that u(x,y) = cosx coshy is harmonic. 2

2 If $f(P) = \oint_C \frac{3z^2 + 7z + 1}{z - p}$ dz, where C : | z | = 3, then find f(2). 2

3 Find the Taylor series expansion of f(z) = $z^3 + 3z^2$ about z = -1. 2

4 The zeros of f(z) = tan hz are __________. 2

5 A random variable X has the following probability distribution : 2

X :	1	2	3	4
P(X) :	K	2K	3K	4K

Find P(X < 3).

6 If X is a random variable and K is a real number, then prove that Var (k X) = K^2 var (X). 3

7 Find the mean of ¡ ^{2} distribution. 3

8 Define a) Null hypothesis and b) Alternate hypothesis 3

9 If one of the regression coefficients is greater than unity, show that the other regression coefficient is less than unity. 3

10 Write down the normal equations to fit the curve y = a + bx + Cx^2 for the data (x : , y:), I =1, 2,3 ………..n). 3

PART – B (50 Marks)

11 a) Prove that an analytic function with constant modulus is a constant. 5

b) Evaluate $\int_C \bar{z}$ dz from z = 0 to z = 9 + 3i along the curve C is given by z=t^2 + it. 5

12 a) Evaluate $\int_C \frac{dz}{z^2 \sinh z}$, where C : | z | = 1 using Residue theorem. 5

b) Prove that under the transformation $W = \frac{z - i}{iz - 1}$, the region Im((z) ≥ 0 is mapped into the region |W| ≤ 1. 5

13 a) A random variable X has the density function $f(x) = \frac{c}{x^2 + 1}$, $-\infty < x < \infty$.

Find i) C and ii) The distribution function of X. 5

b) State and prove Baye's theorem. 5

14 a) Fit a Poisson distribution to the following data and calculate the expected frequencies. 5

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

b) Find the students t for the following variable values in a sample of eight -4, -2, -2, 0, 2, 2, 3, 3 by taking the mean of the universe to be zero. 5

15 a) Using the method of least squares, fit a curve of the form $y = ab^x$ to the following data. 5

x :	1	2	3	4
y :	4	11	35	100

b) A random sample of 5 college students is selected and their grades in mathematics and statistics are found to be : 5

Mathematics :	85	60	73	40	90
Statistics :	93	75	65	50	80

Calculate the rank correlation coefficient.

16 a) Define characteristic function. Find the characteristic function of 5

$$f(x) = \begin{cases} 0, & x < 0 \\ 1, & 0 \le x \le 1 \\ 0, & x > 1 \end{cases}$$

b) Find the analytic function f(z) = u + iv, where $u - v = x^2 - y^2 - x - y - 2xy$. 5

17 a) State and prove Cauchy's integral formula. 5

b) Find the nature of the singularities and the residue of the function

$f(z) = \dfrac{z}{(z^2 - 1)}$ at each of the singularities. 5

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Code No. 5114 / S

FACULTY OF INFORMATICS

B.E. 2/4 (IT) II – Semester (Suppl.) Examination, January 2016

Subject: Probability and Random Process

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A. Answer any five questions from Part B.

PART – A (25 Marks)

1 Define Axiomatic definition of probability. 2

2 A biased coin is tossed till a head appears for the first time. What is the probability that the number of required tossed is odd. 3

3 A box B_1 contains 10 white and 5 red balls, and box B_2 contains 20 white and 20 red balls. A ball is drawn from each box. What is the probability that the ball from B_1 will be white and the ball from B_2 red? 3

4 Draw the graphs of c.d.f. and p.d.f. for the random experiment of the throwing a fair die. 3

5 What is the memory less property of exponential distribution? 3

6 A fair die is rolled 10 times. We shall determine the probability that "f_1" shows three times and "even" shows six times. 3

7 State the properties of cross correlation. 2

8 Show that $|R_{xy}(^{2})| \leq \frac{1}{2}[R_{xx}(0) + R_{yy}(0)]$. 2

9 Define White Noise. 2

10 Define Filter. 2

PART – B (5x10 = 50 Marks)

11 a) A box contains ***m*** white balls and ***n*** black balls. Balls are drawn at random one at a time without replacement. Find the probability of encountering a white ball by the k^{th} draw.

b) A box contains white and black balls. When two balls are drawn without replacement. Supposed the probability that both are white is 1/3. Find the smallest number of balls in the box. 5

12 a) Suppose box 1 contains **a** white balls and **b** black balls, and box 2 contains **c** white balls and **d** black balls. One ball of unknown color is transferred from the first box into the second one and then a ball is drawn from the latter. What is the probability that it will be a white ball? 5

b) We have four boxes. Box 1 contains 2000 components of which 5 % are defective. Box 2 contains 500 components of which 40 % are defective. Box 3 and 4 contain 1000 each with 10% defective. We select at random one of the boxes and we remove at random a single component. What is the probability that the selected component is defective? 5

…2.

13 a) Over a period of 12 hours, 180 calls are made at random. What is the probability that in a four-hour interval the number of calls is between 50 and 70? 4

b) An insurance company has policies to 100,000 people for a premium of $500 person. In the event of causality, the probability of which is assumed to be 0.001, the company pays $200,000 causality. What is the probability that (i) the company will suffer a loss? (ii) The company will make a profit of at least $25 million? 6

14 a) Suppose that the voltage V is a random variable given by V = *i* (R + r_0). Where i = 0.01 A and r_0 = 1000 Ω. If the resistance R is random variable uniform between 900 and 1100 Ω, then V is uniform between 19 and 21volts. 5

b) The random variables X and Y are jointly normal with

$¦_x = 10 \quad ¦_y = 0 \quad ±_x^2 = 4 \quad ±_y^2 = 1 \quad °_{xy} = 0.5$

Find the joint density of random variables Z = X + Y ; W = X – Y 5

15 Given $f_{xy}(x, y) = \begin{cases} k & 0 < x < y < 1 \\ 0; & \text{otherwise} \end{cases}$

Determine $f_{x|y}(x|y)$ and $f_{y|x}(y|x)$ 10

16 a) Given a random variable µ with density $f(µ)$ and a random variable ¨ uniform in the interval $(-®, ®)$ and independent of µ, then prove that the process

$X(t) = a\cos(µt + ¨)$ is wss process. 5

b) The process X (t) is WSS and normal with E {X (t) } = 0 and $R(²) = 4e^{-2|²|}$. Find

$E\{[X(t+1) - X(t-1)]^2\}$. 5

17 a) If {N (t)} is a band limited white noise such that

$S_{NN}(µ) = \frac{N_0}{2}$ for $|µ| < µ_B$

0, elsewhere

find the autocorrelation of { N (t) } 5

b) The impulse response of a low pass filter is $\sim e^{-\sim ²} U(t)$; where $\sim = \frac{1}{RC}$. If a zero mean, white Gaussian process {N (t)} is input into this filter. Find the mean square value and autocorrelation function of the output. 5

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