

3E1642

Roll No. 16EEBEE755

Total No. of Pages : 4

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B. Tech. (Sem. III) (Main/Back) Examination, December - 2017  
Electrical Engg.  
3EE2A Circuit Analysis - I

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit.  
All Questions carry equal marks. Schematic diagrams must be shown  
wherever necessary. Any data you feel missing suitably be assumed and  
stated clearly. Units of quantities used / calculated must be stated  
clearly.

Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)

1. Nil

2. Nil

UNIT - I

1 (a) Explain the variation of resistance, inductance and capacitance reactance  
with frequency.

(b) A variable frequency constant voltage signal generator supplies a RLC  
circuit at sinusoidal mode. Prove that the frequency at which maximum  
voltage across the inductor would appear is

$$\omega = \frac{1}{\sqrt{LC}} \sqrt{\frac{2Q_0^2}{2Q_0^2 - 1}}$$

OR

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[ P.T.O.

(b) Determine the Fourier series of the wave shown in

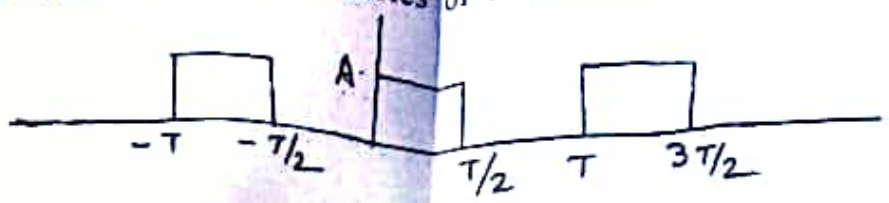


Fig. 4(b).

8

OR

4 Find the line spectrum of following waves using Fourier analysis.

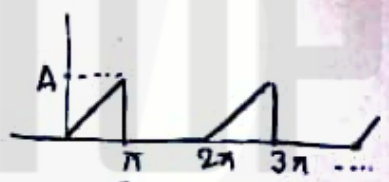


Fig. 4(a)



Fig. 4(b)

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UNIT - V

5 (a) Derive the expression for step response of a RL series and parallel ckt.

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(b) In fig. 5(b) the battery voltage is applied for a steady state period. Obtain the complete expression for the current after closing the switch K.

Assume  $R_1 = 1 \Omega$ ,  $R_2 = 2 \Omega$ ,  $L = 1 H$ ,  $E = 10 V$ .

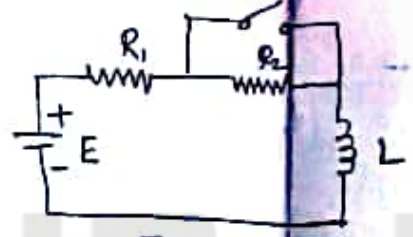


Fig. 5(b)

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OR

5 Explain the following :

- (a) Pulse response of series R.C. circuit.
- (b) Impulse response of series R.C. circuit.

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(b) Solve the following Partial differential equation

$$\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$$

given  $u(0, t) = u_0, t > 0$

$$u(x, 0) = 0, x > 0$$

Also,  $u$  and  $\frac{\partial u}{\partial x}$  approach to zero as  $x \rightarrow \infty$ .

8

UNIT - III

3 (a) Find the Fourier series to represent

$$f(x) = |x| \text{ for } -\pi < x < \pi$$

8

(b) Obtain the shortest distance curve between two given points in a plane.

8

OR

3 (a) Find Half range sine series for the function

$$f(x) = 2x - 1 \text{ in } 0 < x < 1$$

8

(b) Find a plane curve of fixed Perimeter and Maximum Area.

8

UNIT - IV

4 (a) Determine the Analytic function  $w = u + iv$  if

$$u = e^{2x} (x \cos 2y - y \sin 2y)$$

8

(b) Show that the transformation  $w = \frac{2z+3}{z-4}$  maps the circle  $x^2 + y^2 - 4x = 0$  in to the straight line  $4u + 3 = 0$ .

8

OR

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[ P.T.O.

4 (a) Find the Bilinear transformation which transform the point  $z = 2, 1, 0$  in to  $w = 1, 0, i$  respectively. 8

(b) Evaluate the following integral

$$\oint_C \frac{1-2z}{z(z-1)(z-2)} dz \text{ where } C \text{ is the circle } |z|=1.5.$$

8

UNIT - V

5 (a) Expand the function  $\frac{1}{(z-1)(z-2)}$  for

(i)  $|z| < 1$

(ii)  $|z| > 2$

(iii)  $1 < |z| < 2$

in Laurent's series. 8

(b) Find the residue of  $\frac{z^2-2z}{(z+1)^2(z+4)}$  at all its poles in the finite plane. 8

5 (a) Use Cauchy Residue theorem <sup>OR</sup> to evaluate the following integral :

$$\oint_C \frac{z-1}{(z+1)^2(z-2)} dz, C: |z-1|=2$$

(b) Evaluate

$$\int_0^{\infty} \frac{dx}{(x^2+1)^2}$$