

III SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, DECEMBER 2022

## **ELECTRICAL CIRCUIT ANALYSIS [ELE 2153]**

REVISED CREDIT SYSTEM

Time:	3	Hrs.
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## Date: 19 December 2022

Max. Marks: 50

## Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.
- **1A.** Apply a suitable network theorem approach for the circuit shown and hence determine the value of 'R' that will cause current ' $i_b$ ' to be 2mA.



(04)

(02)

(04)

(05)

**1B.** The circuit model for a photovoltaic cell is given in the figure below. The current  $i_{s'}$  is proportional to the solar insolation  $(kW/m^2)$ . Compute the value of load resistance  $R_{L'}$  to yield maximum power transfer from solar cell to load.



**1C.** Obtain the output response of an LTI system for the excitation  $x(t) = e^{-t}u(t)$ . The LTI system has the impulse response given as below.

$$h(t) = \begin{cases} 1; & 0 \le t \le 1 \\ 0; otherwise \end{cases}$$

Use convolution integral approach.

**2A.** Apply the signal transformation technique to obtain a desired signal for certain application given by

y(t) = 2x(-2t + 3) + 3. ;Given x(t) as below.

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**4B**.







- **2C.** Analyse from fundamentals, whether the given LTI system is causal or not. The impulse response of LTI system is  $h(t) = \delta(t+2)$ . Justify your answer.
- **3A.** A parallel RLC circuit with  $R = 5\Omega$ , L = 1mH and  $C = 10\mu$ F is excited by a current source of 10 u(t). Find the voltage across the capacitor using time domain analysis (04)
- **3B.** Find the Laplace transform of the waveform shown in Figure.



- **3C.** A special generator has a voltage waveform given by equation  $v(t) = te^{-t}$  where 't' is time in seconds and  $t \ge 0$ . This generator is connected to a RL series circuit where  $R = 2\Omega, L = 1H$  at time t = 0 by the closing of a switch. Obtain the equation of the current as a function of time i(t).
- **4A.** Analyse the given voltage waveform for its spectral co-efficients and hence plot the magnitude and phase spectrum. Use trigonometric Fourier series technique.



coefficients of the given signal

 $x(t) = 1 + \sin\omega_o t + 2\cos\omega_o t + \cos(2\omega_o t + \frac{\pi}{4})$ 

Where  $\omega_o'$  is the fundamental frequency.

**4C.** Obtain and sketch the Fourier transform of Dirac delta function.

Find the exponential Fourier series representation and Fourier

(05)

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(03)

(03)

- **5A.** The following measurements were made on a two port resistive network. With 10mV applied to port 2 and port 1 open, the current into port 2 is  $0.25\mu A$  and the voltage across port 1 is  $5\mu V$ . With port 2 short circuited and 50mV applied to port 1, the current into port 1 is  $50\mu A$  and the current into port 2 is 2mA. Compute the h - parameters of the network.
- **5B.** Find the y parameters for the given two-port network. Also determine the current in a 5 $\Omega$  resistor connected to the output port if a 10A current source is connected to the input of the two port.



(03)

(02)

**5C.** Compute the transmission parameters of the network by considering the circuit to be an interconnection of three two ports as shown in Figure below.



(05)