CBCS SCHEME

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BEE502

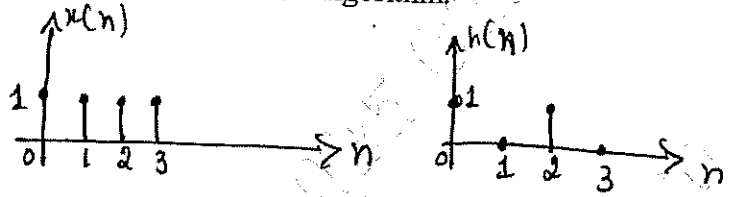
Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Signals and DSP

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	For each of the following signals, determine whether it is periodic and if it is find fundamental period. (i) $x(t) = \sin^3(2\pi t)$ (ii) $x(n) = [-1]^n$	10	L3	CO1
	b.	Determine the system is (i) linear (ii) time invariant (iii) causal (iv) static. Justify the answer. (1) $y(t) = x(3t)$ (2) $y(t) = x(t^2)$	10	L3	CO1
		OR			
Q.2	a.	Find the even and odd components of the following : (i) $x(t) = e^{-2t}\cos t$ (ii) $x(t) = (1+t^3)\cos^{10}(t)$	10	L3	CO1
	b.	Evaluate the convolution integral for a system the input x(t) and impulse response h(t). Given $h(t) = e^{-t}u(t)$, $x(t) = e^{-4t}[u(t) - u(t-3)]$. Also sketch y(t).	10	L3	CO1
		Module – 2			
Q.3	a.	Solve for the output y(n) of a filter whose impulse response h(n) = {1, 2} and input signal. x(n) = {1, 2, –1, 2, 3, –2, –3, – 1, 1} using overlap save method.	10	L3	CO2
	b.	Determine the 4-point circular convolution of sequences $x_1(n) = (\underset{\uparrow}{1}, 2, 3, 1)$ and $x_2(n) = (\underset{\uparrow}{4}, 3, 2, 2.)$ using the time-domain approach and verify the result using frequency-domain approach.	10	L3	CO2
		OR			
Q.4	a.	Compute the 8-point DFT of the sequence x(n) given below. x(n) = (1 , 1 , 1 , 1 , 0 , 0 , 0 , 0)	10	L3	CO2
	b.	State and prove the following properties of DFT: (i) Linearity (ii) Circular time shift (iii) Circular frequency shift.	10	L2	CO2
		Module – 3			
Q.5	a.	Determine 8-point DFT of a sequence x(n) = {1, 2, 3, 4, 4, 3, 2, 1} using Radix-2 DIT-FFT algorithm.	10	L3	CO3
	b.	Compute the 8-point IDFT of the sequence X(K) X(K) = {0, 2 + 2j, –j4, 2 – 2j, 0, 2 + 2j, j4, 2 – 2j } using inverse radix-2 DIT-FFT algorithm.	10	L3	CO3

OR

Q.6	**a.**	Compute the 4-point DFT of the sequence $x(n) = \left(\frac{\pi}{4} n\right)$ using DIT-FFT algorithm.	**06**	**L3**	**CO3**
	b.	Solve for the 4-point circular convolution of x(n) and h(n) given in Fig.Q6(b) using radix-2 DIF-FFT algorithm.  Fig.Q6(b)	**10**	**L3**	**CO3**
	c.	What are the differences and similarities between DIT and DIF-FFT algorithm?	**04**	**L2**	**CO3**

Module – 4

Q.7	**a.**	A butterworth lowpass filter has to meet the following specifications. (i) Passband gain $K_p = -1$ dB at $\Omega_p = 4$ rad/sec (ii) Stopband attenuation greater than or equal to 20 dB at $\Omega_s = 8$ rad/sec. Determine the transfer function $H_a(s)$ of the lowest – order Butterworth filter to meet the above specifications.	**10**	**L3**	**CO4**
	b.	Determine the system function H(z) of the lowest order Chebyshev filter that meets the following specifications. (i) 3 dB ripple in the passband $0 \le \|w\| \le 0.3\pi$ (ii) Atleast 20 dB attenuation in the stopband $0.6\pi \le \|w\| \le \pi$. Use bilinear transformation.	**10**	**L3**	**CO4**

OR

Q.8	**a.**	Draw the block diagrams of direct form-I and direct form-II realizations for a digital IIR filter described by the system function $H(z) = \frac{8z^3 - 4z^2 + 11z - 2}{\left(z - \frac{1}{4}\right)\left(z^2 - z + \frac{1}{2}\right)}$	**10**	**L3**	**CO4**
	b.	Obtain a parallel realization for the transfer function H(z) given below. $H(z) = \frac{8z^3 - 4z^2 + 11z - 2}{\left(z - \frac{1}{4}\right)\left(z^2 - z + \frac{1}{2}\right)}$	**10**	**L3**	**CO4**

Module – 5

Q.9	**a.**	The desired frequency response of a lowpass filter is given by $H_d(e^{jw}) = H_d(w) = \begin{cases} e^{-j3w}, & \|w\| < \frac{3\pi}{4} \\ 0, & \frac{3\pi}{4} < \|w\| < \pi \end{cases}$ Determine the frequency response of the FIR filter if Hamming window is used with N = 7.	**10**	**L3**	**CO5**

	b.	A filter is to be designedwith the following desired frequency response: $H_d(w)=\begin{cases}0 & , \quad -\frac{\pi}{4}<w<\frac{\pi}{4}\\ e^{-j2w} & , \quad \frac{\pi}{4}<\lvert w\rvert<\pi\end{cases}$ Determine the frequency response of the FIR filter designed using a rectangular window defined below. $W_R(n)=\begin{cases}1 & , \quad 0\le n\le 4\\ 0 & , \quad \text{otherwise}\end{cases}$ Also find the frequency, H(w) of the resulting FIR filter.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Determine the coefficients K_m of the lattice filter corresponding to FIR filter described by the system function $H(z)=1+2z^{-1}+\frac{1}{3}z^{-2}$ Also, draw the corresponding second order lattice structure.	**10**	**L3**	**CO5**
	b.	A lowpass filter has the desired frequency response $H_d(w)=H_d(e^{jw})=\begin{cases}e^{-j3w} & , \quad 0<w<\frac{\pi}{2}\\ 0 & , \quad \frac{\pi}{2}<w<\pi\end{cases}$ Determine h(n) based on frequency-sampling technique. Take N = 7.	**10**	**L3**	**CO5**

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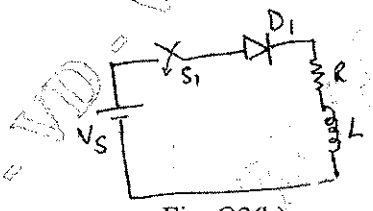
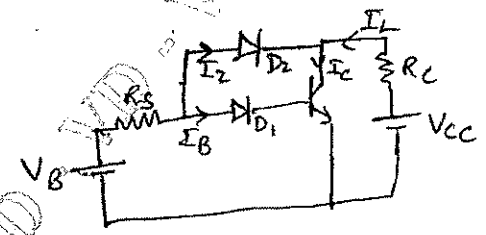
BEE503

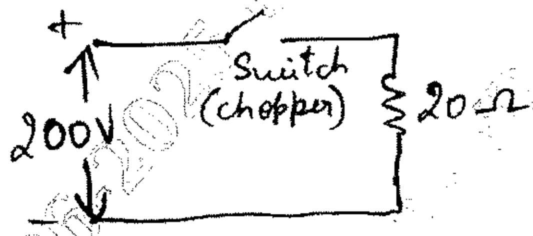
Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Power Electronics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Determine the reverse recovery time and reverse recovery current with its characteristics.	8	L2	CO1
	b.	Explain the characteristics of practical diode with its relevant equation.	7	L1	CO1
	c.	Explain with the block diagram of power electronic system.	5	L2	CO2
		OR			
Q.2	a.	Determine the equation for switched RL load with free wheeling diode.	8	L2	CO2
	b.	A diode RL circuit shown in Fig. Q2 (b) below with $V_S = 220$ V, $R = 4\ \Omega$, $L = 5$ mH. The inductor has no initial current. If switch S_1 is closed at $t = 0$. Determine (i) Steady state diode current. (ii) Energy stored in inductor. (iii) Initial $\frac{di}{dt}$.  Fig. Q2(b)	7	L3	CO2
	c.	Explain the Peripheral effects with a neat block diagram.	5	L1	CO2
		Module – 2			
Q.3	a.	Explain the Base Drive control of BJT turn on method.	7	L1	CO2
	b.	The collector clamping circuit shown in Fig. Q3 (b) below has $V_{CC} = 100$ V, $R_C = 1.5\ \Omega$, $V_{d_1} = 2.1$ V, $V_{d_2} = 0.9$ V, $V_{BE} = 0.7$ V, $V_B = 15$ V, $R_B = 2.5\ \Omega$, $\beta = 16$. Calculate : (i) Collector current without clamping. (ii) Collector-emitter clamping voltage V_{CE}. (iii) Collector current with clamping  Fig. Q3 (b)	7	L3	CO2
	c.	Describe the switching limits of the power transistors.	6	L2	CO2

		OR			
Q.4	**a.**	Explain gate drive of MOSFET with a neat circuit diagram.	**6**	**L1**	**CO3**
	b.	Explain the structure of IGBT and its working.	**7**	**L3**	**CO3**
	c.	A simple transistor switch is used to connect a 24 V. DC supply across a relay coil, which has a DC resistance of 200 Ω. An input pulse of 0 to 5 V amplitude is applied through a series base resistor R_B at the base so as to turn on transistor switch. Calculate (i) I_{CS} (ii) Value of R_B required to obtain ODF = 2. (iii) Total power dissipation in transistor that occurs during the saturation state.	**7**	**L3**	**CO3**
		Module – 3			
Q.5	**a.**	Derive an expression of anode current on two transistor Analogy model of thyristor.	**7**	**L3**	**CO3**
	b.	Explain the forced commutation with its neat waveform.	**6**	**L1**	**CO3**
	c.	Describe thyristor RC Firing circuit with its waveform.	**7**	**L3**	**CO3**
		OR			
Q.6	**a.**	Derive an equation of series connection of thyristors with a neat circuit diagram.	**7**	**L2**	**CO3**
	b.	Explain the modes of operation on an thyristor.	**6**	**L1**	**CO4**
	c.	Describe an operation of unijunction transistor with its V-I characteristics.	**7**	**L2**	**CO4**
		Module – 4			
Q.7	**a.**	Describe the operation of single phase half wave circuit with R-L load.	**6**	**L2**	**CO4**
	b.	Describe the principle of operation on single phase dual converters and determine the circulating current.	**7**	**L2**	**CO4**
	c.	A single phase half wave controlled rectifier is used to supply power to 10 Ω load from 230 V, 50 Hz supply at a firing angle of 30°, calculate (i) Average output voltage. (ii) Effective output voltage. (iii) Average load current.	**7**	**L3**	**CO5**
		OR			
Q.8	**a.**	Explain the operation of single phase full wave AC voltage controller with R load.	**6**	**L1**	**CO5**
	b.	Describe the principle of phase control of single phase half wave AC voltage controller.	**7**	**L2**	**CO5**
	c.	An AC voltage controller has a resistive load of 10 Ω and RMS input voltage 120 V, 60 Hz. The thyristor switch is on for n = 25 cycles and off form = 75 cycles. Determine : (i) RMS output voltage V_0 (ii) Input power factor (iii) Average and RMS current of thyristors.	**7**	**L3**	**CO5**
		Module – 5			
Q.9	**a.**	Describe the classification of DC-DC converters. With its circuit diagram and waveforms (any 2).	**10**	**L2**	**CO6**
	b.	Discuss on the performance parameter of a chopper.	**5**	**L2**	**CO6**
	c.	Discuss on the chopper control techniques.	**5**	**L2**	**CO6**

		OR			
Q.10	**a.**	Explain the operation of 180° conduction type three phase inverter. With circuit diagram and waveforms.	**10**	**L1**	**CO6**
	b.	A chopper circuit is operating on TRC at a frequency of 2 kHz on a 460 V supply of the load voltage of 350 V. Calculate the conduction period of the thyristor in each cycle.	**5**	**L3**	**CO6**
	c.	Considering the switch to be ideal in the circuit of Fig. Q10 (c). Determine (i) The duty cycle, for which the output average dc voltage and rms voltage are equal. (ii) The chopper efficiency.  Fig. Q10 (c)	**5**	**L3**	**CO6**

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BEE515A

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
High Voltage Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Derive an expression for the current growth in the air gap considering Townsend first ionization coefficient.	8	L3	CO1
	b.	State and explain Paschen's law.	8	L2	CO1
	c.	In an experiment in a certain gas it was found that the steady state current is 5.5×10^{-8} at 8 KV at a distance of 0.4 cm between the plane electrodes keeping the field constant and reducing the distance to 0.1 cm results in a current of 5.5×10^{-9} A. Calculate primary ionization co-efficient α.	4	L3	CO1
		OR			
Q.2	a.	Explain the bubble theory and suspended particle theory of breakdown in liquid dielectric.	10	L2	CO1
	b.	Explain the electromechanical breakdown and thermal breakdown mechanism in solid dielectric.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the working of Cockcroft – Watton type voltage multiplier circuit with schematic diagram.	10	L2	CO2
	b.	With a neat diagram explain the working of Vande – Graff generator and its applications.	10	L2	CO2
		OR			
Q.4	a.	With a suitable diagram, explain the Marx circuit arrangement for multistage impulse generation and draw the modified diagram.	10	L2	CO2
	b.	Explain with a neat sketch generation of HVAC of 3-stagte cascaded transformer.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the working principle of generating voltmeter with a diagram.	10	L2	CO3
	b.	Explain the working and construction of electrostatic voltmeter used for measurement of HVAC.	10	L2	CO3
		OR			
Q.6	a.	What is Rogowski Coil? Explain with a neat diagram its principle of operation for measurement of high impulse current.	10	L2	CO3
	b.	Explain the factors influencing the spark over voltages of sphere gap.	4	L2	CO3
	c.	Explain the CRO with block diagram.	6	L2	CO3
		Module – 4			
Q.7	a.	Explain the different theories of charge formation in cloud.	10	L2	CO4
	b.	Explain the different lighting strokes on transmission lines.	4	L2	CO4
	c.	Write short notes on : i) Expulsion gaps ii) Protector tubes.	6	L2	CO4

		OR			
Q.8	**a.**	With neat diagram explain the working principle of surge arrester.	**10**	**L2**	**CO4**
	b.	Explain the principles of insulation coordination on HV and EHV power system.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the method of measuring dielectric loss at power frequency using high voltage Schering bridge.	**10**	**L2**	**CO5**
	b.	Discuss the method of discharge detection using Straight detection method.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain in detail testing of short-circuit tests on circuit breaker.	**10**	**L2**	**CO5**
	b.	Write short notes on Testing of cables.	**5**	**L2**	**CO5**
	C.	What are the various Test done on transformers? Explain in detail impulse testing of transformer.	**5**	**L2**	**CO5**

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CBCS SCHEME - Make-Up Exam

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BEE613B

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025
Embedded System Design

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define embedded system and differentiate between general purpose computing system and embedded system.	8	L2	CO1
	b.	Describe the classification of embedded system based on complexity and performance.	6	L2	CO1
	c.	Discuss about Harvard and von-/Neumann architecture with neat diagrams.	6	L2	CO1
		OR			
Q.2	a.	Write down any six differences between RISC and CISC.	6	L2	CO1
	b.	Explain serial peripheral interface (SPI) bus with neat diagram.	6	L2	CO1
	c.	Explain in detail about brown-out protection circuit with neat diagram.	8	L2	CO1
		Module – 2			
Q.3	a.	What is operational quality attribute? Explain the important operational quality attributes to be considered in any embedded system design.	10	L2	CO2
	b.	Explain the product life cycle curve of an embedded product with neat graph.	10	L2	CO2
		OR			
Q.4	a.	Explain the role of embedded systems in automotive domain.	10	L2	CO2
	b.	Explain the different communication buses used in automotive domain.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the control data flow graph model with neat flow chart.	10	L2	CO3
	b.	Explain the role of analog electronic components in an embedded hardware design.	10	L2	CO3
		OR			
Q.6	a.	Explain the various degree of integration of an IC and also the categories of IC design.	10	L2	CO3
	b.	Design an automatic tea/coffee vending machine based on FSM model for the following requirement : The tea/coffee vending is initiated by user inserting a 5 rupee coin, after inserting the coin, the user can either select 'coffee' or 'Tea' or press 'cancel' to cancel the order and take back the coin.	10	L3	CO3
		Module – 4			
Q.7	a.	Explain briefly super loop based approach.	10	L2	CO4
	b.	Describe the types of files generated on cross complication.	10	L2	CO4
		OR			
Q.8	a.	Explain the process of conversion of high level language to assembly language with neat diagram.	10	L2	CO4
	b.	Mention the advantages and disadvantages of assembly language based development.	10	L2	CO4
		Module – 5			
Q.9	a.	Describe in brief about task scheduling.	10	L2	CO5
	b.	Explain about microkernel model with neat figure.	10	L2	CO5
		OR			
Q.10	a.	Explain in detail operating system architecture with neat diagram.	13	L2	CO5
	b.	Write down the differences between thread and process.	7	L2	CO5

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CBCS SCHEME - Make-Up Exam

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BEE654B

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025
Technologies of Renewable Energy Sources

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the causes of energy scarcity.	7	L2	CO1
	b.	Explain the layers of the sun with a neat sketch.	7	L2	CO1
	c.	Calculate zenith angle of the sun at Bhopal (26.75°N) at 10.30 am on March 11, 2025.	6	L2	CO1
		OR			
Q.2	a.	Write a short note on the following: i) Hour Angle ii) Declination Angle	7	L2	CO1
	b.	Explain the classification of energy resources.	7	L2	CO1
	c.	Discuss the applications of solar thermal energy.	6	L2	CO1
		Module – 2			
Q.3	a.	Write short on solar cooker.	6	L2	CO2
	b.	Explain with a neat sketch Heliostat electric generating plant.	8	L2	CO2
	c.	With a neat sketch, explain the IV characteristics of a solar cell.	6	L2	CO2
		OR			
Q.4	a.	Discuss about photovoltaic panels with appreciate equations.	6	L2	CO2
	b.	Explain solar water heating system with a neat sketch.	8	L2	CO2
	c.	Discuss the advantages and disadvantages of concentrating collectors over flate plate collectors.	6	L2	CO2
		Module – 3			
Q.5	a.	List the advantages and disadvantages of hydrogen energy.	5	L1	CO3
	b.	Explain the hydrogen production, techniques in detail.	10	L2	CO3
	c.	Discuss the benefits of waste recycling system.	5	L2	CO3

		OR			
Q.6	**a.**	List the factors for wind turbine site a selection.	**5**	**L1**	**CO3**
	b.	Explain with a neat sketch dry steam geothermal electric power plant.	**10**	**L2**	**CO3**
	c.	Discuss the factors affecting the selection of a biogas plant.	**5**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	List the advantages and disadvantages of tidal power generation.	**5**	**L1**	**CO4**
	b.	With a neat diagram, explain single basin and two basin tidal power plants.	**10**	**L2**	**CO4**
	c.	Write short notes on characteristics of biomass feed.	**5**	**L2**	**CO4**
		OR			
Q.8	**a.**	List the benefits of biogas.	**5**	**L1**	**CO4**
	b.	Explain with a neat sketch, floating dome type biogas plant.	**10**	**L2**	**CO4**
	c.	Write short note on updraft gasifier.	**5**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Enumerate the advantages and disadvantages of wave power.	**5**	**L1**	**CO5**
	b.	Explain the devices used for harnessing wave energy.	**10**	**L2**	**CO5**
	c.	Explain Rankine cycle with a sketch.	**5**	**L2**	**CO5**
		OR			
Q.10	**a.**	List the applications of OTEC.	**5**	**L1**	**CO5**
	b.	Explain closed cycle and open cycle of ocean thermal energy.	**10**	**L2**	**CO5**
	c.	Write short notes on working of sea wave energy.	**5**	**L2**	**CO5**

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