CBCS SCHEME

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BMATEC301/BEC301/BBM301

Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

AV Mathematics-III for EC/BM Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book and Statistical table are permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Obtain the Fourier Series expansion of $f(x)=x^2$ in $[-\pi \;\; \pi]$.	7	L2	CO1
	b.	Obtain half range Fourier sine series for $f(x)=x(\ell-x)$ in $(0,\ell)$.	7	L2	CO1
	c.	Find the constant term and the first harmonics of the Fourier Series of $y=f(x)$, given that	6	L3	CO1

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
y	7.9	7.2	3.6	0.5	0.9	6.8	7.9

OR

			M	L	C
Q.2	a.	Obtain Fourier Series expansion of $f(x)=\frac{1}{4}(\pi-x)^2$ in $(0, 2\pi)$.	7	L2	CO1
	b.	Obtain half range Fourier Cosine series for $f(x)=2x-1$ in (0, 1)	7	L2	CO1
	c.	Find the constant term and the first harmonics in the Fourier Series of $y=f(x)$, given by	6	L3	CO1

x	0	1	2	3	4	5	6
y	1.98	1.3	1.05	1.3	-0.88	-0.25	1.98

		Module – 2	M	L	C
Q.3	a.	Find the complex Fourier transform of, $f(x)=\begin{cases}1 & \text{for } \lvert x\rvert \le 1 \\ 0 & \text{for } \lvert x\rvert < 1\end{cases}$, and hence evaluate $\int_0^\infty \frac{\sin x}{x}dx$.	7	L2	CO2
	b.	Find the Fourier sine transform of $f(x)=\frac{e^{-ax}}{x}$, where 'a' is positive real.	7	L2	CO2
	c.	Find the descrete Fourier transform of the sequence $\{1, 2, 1, 3\}$	6	L3	CO2

OR

			M	L	C
Q.4	a.	Find the Fourier Transform of $f(x)=e^{-a\lvert x\rvert}$.	7	L2	CO2
	b.	Solve the integral equation, $\int_0^\infty f(x)\cos(ux)dx=\begin{cases}1-u & \text{for } 0\le u\le 1 \\ 0 & \text{for } u>1\end{cases}$	7	L3	CO2
	c.	Solve the Integral equation, $\int_0^\infty f(\theta)\cos\alpha\theta=\begin{cases}1-\alpha, & 0\le\alpha\le 1 \\ 0, & \alpha>1\end{cases}$. Hence evaluate $\int_0^\infty \frac{\sin^2 t}{t^2}dt$.	6	L3	CO2

Module – 3

Q.5	a.	Find the z-transform of, (i) $\sin(n\theta)$ (ii) $\cosh(n\theta)$	7	L2	CO3
	b.	Find the inverse z-transform of $\dfrac{z^2-z}{(z-3)^2}$	7	L2	CO3
	c.	Solve $y_{n+2}-4y_{n+1}+3y_n=1$, given that $y_0=0$, $y_1=1$	6	L3	CO3

OR

Q.6	a.	Find the z-transform of, $\cos\left(\dfrac{n\pi}{4}\right)+3^n n^2$	7	L2	CO3
	b.	If $z\{u_n\}=\dfrac{2z^2+3z+4}{(z-3)^3}$; then find u_0, u_1 and u_2.	7	L2	CO3
	c.	Solve $y_{n+2}+2y_{n+1}+y_n=n$, given $y_0=0$, $y_1=0$.	6	L3	CO3

Module – 4

Q.7	a.	Solve $y''+5y'+6y=e^{-2x}+\sin x$	7	L2	CO4
	b.	Solve $2\dfrac{d^2y}{dx^2}+2\dfrac{dy}{dx}+3y=x^2+2x-1$	7	L2	CO4
	c.	Solve $(2x+1)^2y''-2(2x+1)y'-12y=6x+5$	6	L3	CO4

OR

Q.8	a.	Solve $(D^3-6D^2+11D-6)y=e^{-2x}+\cos x$	7	L2	CO4
	b.	Solve $x^2y''-3xy'+5y=3\sin(\log x)$	7	L3	CO4
	c.	An emf of $E\sin(pt)$ is applied at $t=0$ to a circuit containing capacitance C and inductance L, the current i satisfies. $L\dfrac{di}{dt}+\dfrac{1}{C}\int i\,dt=E\sin(pt)$ If $p^2=\dfrac{1}{LC}$ and initially current and charge q are zero, then find the current i at any time t.	6	L3	CO4

Module – 5

Q.9	a.	Fit a parabola $y=a+bx+cx^2$ by the method of least squares for the following data:	7	L2	CO5
	b.	Obtain the lines of regression for the data, also find co-efficient correlation.	7	L2	CO5
	c.	Compute the rank correlation co-efficient for the data :	6	L3	CO5

Q.9 a. data:

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

Q.9 b. data:

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

Q.9 c. data:

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70

<table>
<tr><td colspan="6" align="center">OR</td></tr>
<tr><td>Q.10</td><td>a.</td><td>Fit a least square curve $y = ax^b$ for the data :
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>y</td><td>0.5</td><td>2</td><td>4.5</td><td>8</td><td>12.5</td></tr>
</table></td><td>7</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Given the regression lines $x = 19.13 - 0.87y$ and $y = 11.64 - 0.5x$. Compute mean of data x and mean of data y, also find co-efficient of correlation.</td><td>7</td><td>L3</td><td>CO5</td></tr>
<tr><td></td><td>c.</td><td>Ten competitors in a music contest are ranked by 3 judges A, B and C in the following order. Find the pair of judges have the nearest approach to common taste of music.
<table>
<tr><td>A</td><td>1</td><td>6</td><td>5</td><td>10</td><td>3</td><td>2</td><td>4</td><td>9</td><td>7</td><td>8</td></tr>
<tr><td>B</td><td>3</td><td>5</td><td>8</td><td>4</td><td>7</td><td>10</td><td>2</td><td>1</td><td>6</td><td>9</td></tr>
<tr><td>C</td><td>6</td><td>4</td><td>9</td><td>8</td><td>1</td><td>2</td><td>3</td><td>10</td><td>5</td><td>7</td></tr>
</table></td><td>6</td><td>L3</td><td>CO5</td></tr>
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BEC302

Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Digital System Design using Verilog

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 with a neat block diagram, the steps involved in realizing logic circuit from a problem statement.	06	L1	CO1
	b.	Identify the prime implicants and essential prime implicants of the following functions using Karnaugh map. i) $f(a, b, c, d) = \Sigma m(0, 1, 2, 5, 6, 7, 8, 9, 10, 13, 14, 15)$ ii) $f(a, b, c, d) = \prod M(0, 2, 3, 8, 9, 10, 12, 14)$	10	L2	CO1
	c.	Express the equation in proper canonical form: $G = f(w, x, y, z) = w'x + yz'$	04	L2	CO1
		OR			
Q.2	a.	Simplify the following equation $S = f(w, x, y, z) = \Sigma(1, 3, 13, 15) + \Sigma d(8, 9, 10, 11)$ using Quine – McClusky technique.	12	L2	CO1
	b.	An electric motor powering a conveyor used to move material is to be turned on when one of two operators is in position. If material is present to be moved and if the protective interlock switch is not open input and output variables are to expressed in binary, that is, if operator 1 is in position and the associated variable is a logical 0. The motor is running (on) if its output control variable is a '1' and the motor is off if the output variable is 0. write the truth table for the control problem and write the switching equation for the output that turns the motor ON.	08	L3	CO1
		Module – 2			
Q.3	a.	Explain the need for look ahead carry adders in reduction of propagation of delay by considering 4-bit parallel look ahead carry adder and deriving relevant equations at each stage.	12	L2	CO2
	b.	What are Decoders? Implement the following functions using a 3 to 8 line decoder: i) $f_1(a, b, c) = \Sigma m(0, 4, 6, 7)$ ii) $f_2(a, b, c) = \prod M(1, 4, 5)$	08	L2	CO2
		OR			
Q.4	a.	With a neat block diagram, explain decimal adders. Write a truth table to show decimal SUM, Binary SUM and BCD SUMS. Also generate the correction function from the truth table.	10	L2	CO2
	b.	Define encoders. Design a 8 to 3 line priority encoder with a neat truth table and write Boolean expressions for the outputs.	10	L4	CO2
		Module – 3			
Q.5	a.	Explain the operation of Master-Slave SR Flip-Flop with relevant waveforms.	10	L3	CO3
	b.	Derive the characteristic equations for SR, JK, D and T flip-flops from their respective functional tables.	10	L3	CO3

		OR			
Q.6	**a.**	What are registers? Illustrate the four possible ways through which registers transfer information.	**10**	**L2**	**CO3**
	b.	Design a synchronous mod-6 counter using clocked JK flip flops.	**10**	**L4**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the structure of a verilog module and list out the various operator used in verilog coding with examples.	**10**	**L4**	**CO4**
	b.	Write a verilog code for a 2:1 multiplexer with necessary logic diagram and simulation waveforms.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Explain the different types of descriptions used in verilog coding.	**10**	**L3**	**CO4**
	b.	Write a verilog code using dataflow description for a half adder with necessary waveforms and truth table.	**06**	**L3**	**CO4**
	c.	Write a verilog code for the Boolean expressions given below: $Y_1 = ab'c + ab + (a \oplus b)$ $Y_2 = (wx) + (w'y) + w\,x\,y$	**04**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	With necessary flow chart explain D-latch along with a verilog code and simulation waveform.	**10**	**L3**	**CO5**
	b.	With necessary logic diagram, explain behavioural description for a 3-bit Binary counter using case statements in verilog code.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Differentiate case X and case Z statements in verilog and write a verilog code for a 4-bit priority encoder using case X statement.	**10**	**L3**	**CO5**
	b.	With necessary flow chart explain Booth multiplication algorithm and write a verilog code for the same.	**10**	**L3**	**CO5**

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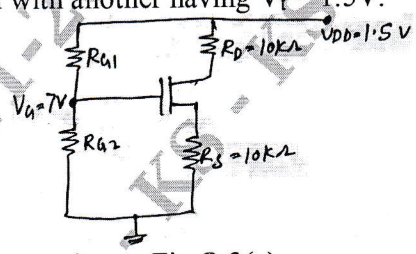
BEC303

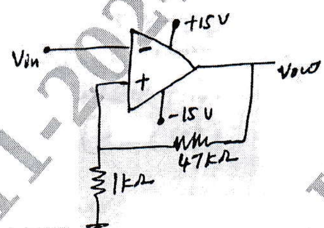
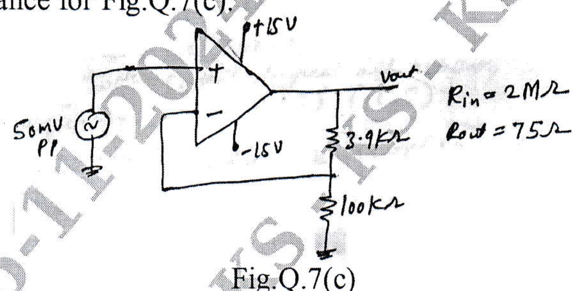
Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

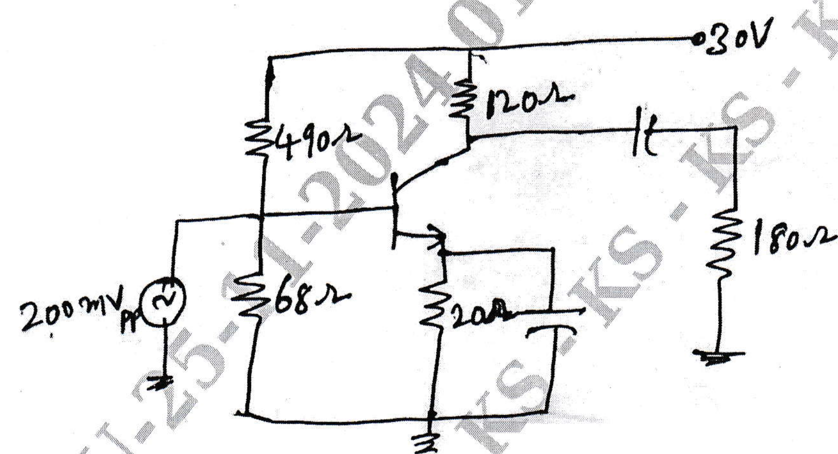
Electronic Principles and Circuits

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.

			M	L	C
		Module – 1			
Q.1	**a.**	Analyze voltage divider bias circuit with equations.	8	L4	CO1
	b.	Explain two supply emitter bias circuit with equations.	8	L2	CO1
	c.	If $R_1 = 10\Omega$, $R_2 = 2.2K\Omega$, $R_C = 3.6K\Omega$, $R_E = 1K\Omega$, $V_{CC} = 10V$ calculate collector to emitter voltage for voltage divider bias.	4	L3	CO1
		OR			
Q.2	**a.**	Describe the small signal operation with diagram, write the 10 percent rule.	8	L2	CO1
	b.	Analyze common emitter amplifier with equations.	8	L4	CO2
	c.	Compute the output impedance for emitter follower with $R_1 = 10K\Omega$, $R_2 = 10K\Omega$, $R_E = 100\Omega$, $R_C = 100\Omega$, $V_{CC} = 30V$, $R_G = 600\Omega$, $V_{in} = 1V$.	4	L3	CO2
		Module – 2			
Q.3	**a.**	Explain following biasing MOS circuits: i) Fixing VGS ii) Drain to gate feedback resistor.	8	L2	CO2
	b.	Describe small signal equivalent circuit model of MOSFET.	6	L2	CO1
	c.	For the circuit shown in Fig.Q.3(c), determine value of VGS to establish dc bias current $I_D = 0.5mA$. Device parameters are $V_t = 1V$ K'_n W/L = $1mA/V^2$ and X = 0. What is percentage change in I_D when transistor is replaced with another having $V_t = 1.5V$.  Fig.Q.3(c)	6	L3	CO1
		OR			
Q.4	**a.**	Analyze common source amplifier without source resistance and derive expression for voltage gain.	10	L4	CO2

	b.	Analyze common drain (source follower) amplifier and derive expression for voltage gain.	10	L4	CO2
Module – 3					
Q.5	a.	Demonstrate how digital values are converted to analog values using R-2R DAC with example.	8	L3	CO4
	b.	Analyze comparator with non zero reference (positive voltage) with transfer characteristics.	8	L4	CO4
	c.	If V_{sat} = 13.5V computer trip points (UTP and LTP) and hysteresis for Fig.Q.5(c).  Fig.Q.5(c)	4	L3	CO4
OR					
Q.6	a.	Demonstrate without any input how colpitts oscillator generates output. Determine frequency of oscillations with C_1 = 0.001μF, C_2 = 0.01μF, L = 15μH.	10	L3	CO2
	b.	Explain Monostable operation of 555 timer with diagram and necessary equations.	10	L2	CO4
Module – 4					
Q.7	a.	Sketch four types of negative feedback topologies and explain in brief.	8	L3	CO3
	b.	Analyze current controlled current source (ICIS) amplifier with equations.	6	L4	CO3
	c.	Calculate feedback fraction, closed loop voltage gain input impedance and output impedance for Fig.Q.7(c).  Fig.Q.7(c)	6	L2	CO3
OR					
Q.8	a.	Classify filters based on ideal responses.	8	L4	CO4
	b.	Explain VCVS unity gain second order low pass filter with equations.	6	L2	CO4
	c.	Explain Bandstop filter with diagram and equations.	6	L2	CO4

		Module – 5			
Q.9	**a.**	Classify power amplifiers based on classes.	**8**	**L4**	**CO2**
	b.	What is crossover distortion? Explain operation of class B transformer coupled push pull amplifier with diagram.	**8**	**L1**	**CO2**
	c.	If peak to peak output voltage is 18V input impedance of base is 100Ω what is power gain for Fig.Q.9(c).  Fig.Q.9(c)	**4**	**L1**	**CO2**
		OR			
Q.10	**a.**	Describe structure of SCR and explain gate triggering.	**6**	**L2**	**CO5**
	b.	Explain how RC circuit control SCR phase angle with circuit diagram and necessary equations.	**8**	**L2**	**CO5**
	c.	Describe UJT relation oscillator.	**6**	**L2**	**CO5**

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CBCS SCHEME

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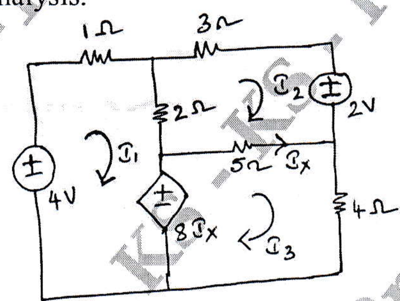
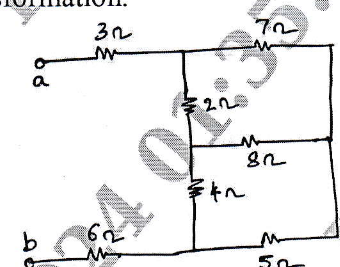
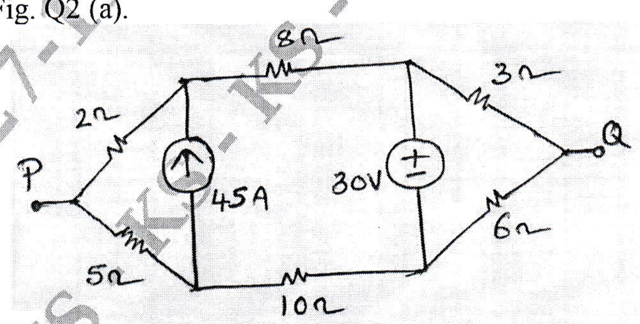
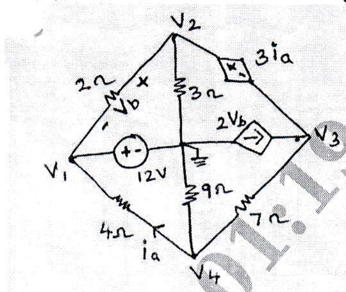
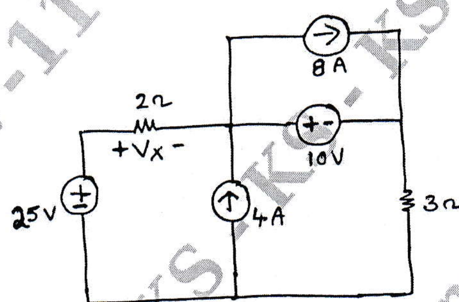
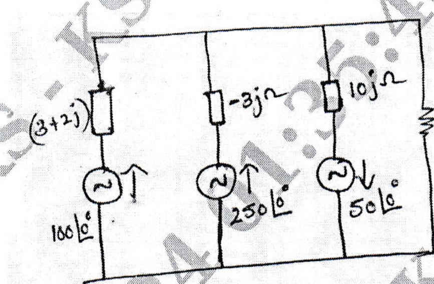
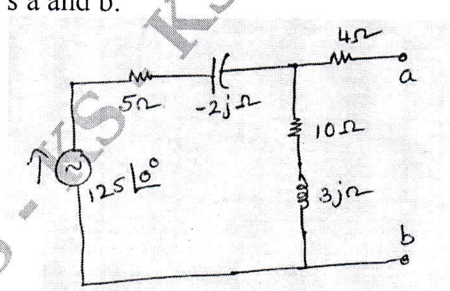
Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

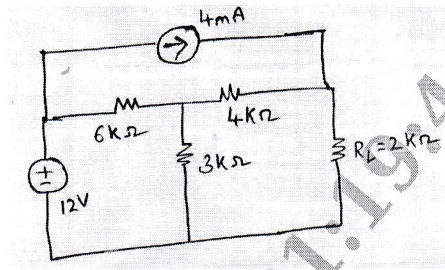
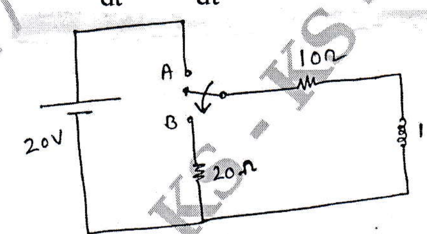
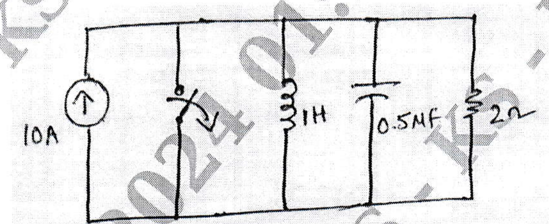
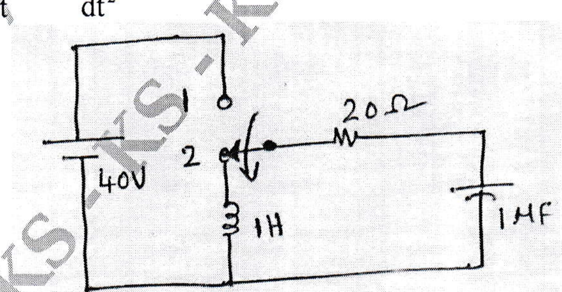
Network Analysis

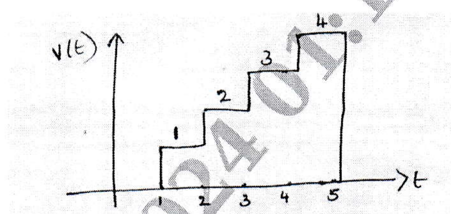
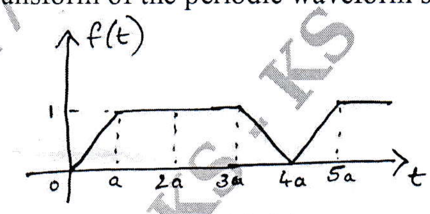
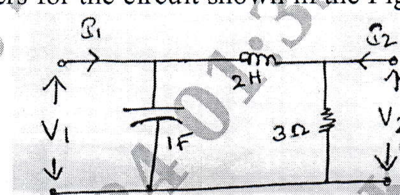
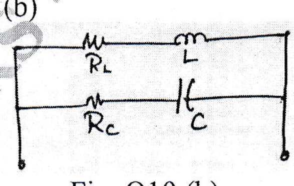
Time: 3 hrs. Max. Marks: 100

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.	Compare the following : (i) Active and Passive elements (ii) Linear and Non-linear elements	4	L2	CO1
	b.	For the circuit shown below in Fig. Q1 (b), find the mesh currents and the value I_X using mesh analysis.  Fig. Q1 (b)	8	L3	CO1
	c.	For the circuit of Fig. Q1 (c), find the equivalent resistance between a and b using star to delta transformation.  Fig. Q1 (c)	8	L3	CO1
		OR			
Q.2	a.	Using source shift and source transformations, simplify the circuit between P and Q in Fig. Q2 (a).  Fig. Q2 (a)	10	L4	CO1

	b.	For the circuit in Fig. Q2 (b), find all the node voltages using node analysis.  Fig. Q2 (b)	10	L3	CO1
		Module – 2			
Q.3	a.	State and prove Thevnin theorem.	5	L2	CO2
	b.	For the circuit shown in Fig. Q3 (b), find the voltage V_X using superposition theorem.  Fig. Q3 (b)	8	L4	CO2
	c.	Find the current through the load of 1 KΩ, using Millman's theorem in Fig. Q3 (c).  Fig. Q3 (c)	7	L3	CO2
		OR			
Q.4	a.	State and prove maximum power transfer theorem for DC circuit with variable load R_L.	6	L2	CO2
	b.	For the circuit shown in Fig. Q4 (b). Find the Norton equivalent circuit across the terminal's a and b.  Fig. Q4 (b)	6	L3	CO2

	c.	For the circuit shown in Fig. Q4 (c). Find the current through the load using Thevnin approach.  Fig. Q4 (c).	8	L3	CO2
Module – 3					
Q.5	a.	Explain the importance of study of initial conditions in electric circuit analysis and also explain the behavior of R, L and C elements for transients.	10	L2	CO3
	b.	For the circuit shown in Fig.Q5 (b), steady state has been reached with the switch K on Position 'A'. The switch is moved to position B at t = 0. Determine the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t(0^+)$.  Fig. Q5 (b)	10	L3	CO3
OR					
Q.6	a.	For the network shown in Fig. Q6 (a) at t = 0, switch is opened, calculate v, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ at $t = 0^+$.  Fig. Q6 (a)	10	L3	CO3
	b.	For the network shown in Fig. Q6 (b). Switch is changed from position 1 to position 2 at t = 0. Steady condition have reaced before switching. Find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.  Fig. Q6 (b)	10	L3	CO3

		Module – 4			
Q.7	**a.**	Find the Laplace transform's of the following functions : (i) Unit step function (ii) $\sin \omega t$ (iii) $\cosh(at)$ (iv) $t.\cos(at)$	**10**	**L3**	**CO4**
	b.	Find the Laplace transform of the staircase waveform shown in the Fig. Q7 (b).  Fig. Q7 (b)	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	State and explain the following : (i) STEP function (ii) Impulses responses	**10**	**L2**	**CO4**
	b.	Find the Laplace transform of the periodic waveform shown in Fig. Q8 (b).  Fig. Q8 (b)	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Define the following : (i) Resonance (ii) Quality factor	**4**	**L1**	**CO5**
	b.	Obtain Z-parameters interms of Y-parameters.	**6**	**L3**	**CO5**
	c.	Find the H parameters for the circuit shown in the Fig. Q9 (c).  Fig. Q9 (c)	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	A series RLC circuit has R = 10 Ω, L = 0.01 H and C = 100 μF, which is connected across 100 V supply. Calculate (i) F_r (ii) Q (iii) B.W (iv) I_r (v) f_1 and f_2	**10**	**L3**	**CO5**
	b.	Derive the expression of resonating frequency for the parallel resonant circuit shown in Fig. Q10 (b)  Fig. Q10 (b)	**10**	**L3**	**CO5**

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CBCS SCHEME

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BEC306C

Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Computer Organization and Architecture

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.	With a neat block diagram, explain the basic functional units of a computer.	7	L2	CO1
	b.	Explain straight line sequencing. Build a program to add A + B to form C.	6	L3	CO1
	c.	Illustrate big endian and little endian byte addressability.	7	L2	CO1
		OR			
Q.2	a.	Draw the single bus structure and explain the same.	7	L2	CO1
	b.	Explain the connection between processor and memory with neat diagram.	7	L2	CO1
	c.	List the different systems used to represent signed numbers. Solve any two of the following operations on the 8 bit signed number using 2's complement representation. (i) +2, +3 (Addition) (ii) +4, -6 (Addition) (iii) -5, -2 (Addition) (iv) +7, -3 (Addition)	6	L3	CO1
		Module – 2			
Q.3	a.	What is an addressing mode? Explain any five types of addressing modes with examples.	12	L2	CO2
	b.	What is subroutine linkage? Explain with an example subroutine linkage using linkage register. Develop a program to add N numbers by calling parameters by register.	8	L3	CO2
		OR			
Q.4	a.	Illustrate how PUSH and POP operations are performed with an example. Builds a program for safe PUSH and safe POP operations.	10	L3	CO2
	b.	Analyze the following instructions and find the values of R_1, R_2 and R_3 after the execution by considering the initial values of $R_1 = 10101011$, $R_2 = 11001100$, $R_3 = 11100001$, $R_4 = 11000110$, $R_5 = 01011010$ and CY = 1 (i) Lshiftb #3, R_1 (ii) LshiftR #3, R_2 (iii) AshiftR #1, R3 (iv) RotateRC, #2, R4 (v) RotateLC #2, R5	10	L3	CO2
		Module – 3			
Q.5	a.	With a neat diagram, explain I/O interface for an input device.	7	L2	CO3
	b.	Explain the following with respect to interrupts, (i) Vectored interrupts (ii) Interrupt nesting	6	L2	CO3

	c.	With supporting diagram, how multiple priority scheme can be implemented by using separate interrupt request and interrupt acknowledge line for each device.	7	L2	CO3
		OR			
Q.6	a.	Explain how PMA is taking place in the system with relevant diagram.	10	L2	CO3
	b.	Explain basic I/O operations Build a program that reads a line of characters and display it.	10	L2	CO3
		Module – 4			
Q.7	a.	Define : (i) Memory latency (ii) Memory bandwidth (iii) Hit rate (iv) Miss penalty	8	L2	CO4
	b.	Construct an internal organization of $2M \times 8$ dynamic memory chip and explain the same.	12	L3	CO4
		OR			
Q.8	a.	Demonstrate how $1K \times 1$ memory chip is assessed using relevant diagrams.	10	L2	CO4
	b.	With neat diagram demonstrate read and write operations of basic SRAM.	10	L2	CO4
		Module – 5			
Q.9	a.	Discuss the control sequence for execution of instruction ADD (R_3), R_1	8	L2	CO5
	b.	Discuss the control sequence for the instruction ADD R_4, R_5, R_6 for the three bus organization.	12	L2	CO5
		OR			
Q.10	a.	What do you mean by micro instruction? Explain basic organization of microprogram control unit. Construct the sequence of microinstructions for the instruction ADD (R_3), R_1	10	L3	CO5
	b.	Describe single bus organization of data path inside the processor.	10	L2	CO5

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