CBCS SCHEME

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18MAT31

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Evaluate (i) $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L(t^2 e^{-3t} \sin 2t)$ **(06 Marks)**

b. If $f(t) = \begin{cases} t, & 0 \le t \le a \\ 2a - t, & a \le t \le 2a \end{cases}$, $f(t + 2a) = f(t)$ then show that $L(f(t)) = \frac{1}{s^2}\tanh\left(\frac{as}{2}\right)$ **(07 Marks)**

c. Solve by using Laplace Transforms

$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t},\ y(0) = 0,\ y'(0) = 0$$ **(07 Marks)**

OR

2 a. Evaluate $L^{-1}\left(\frac{4s+5}{(s+1)^2(s+2)}\right)$ **(06 Marks)**

b. Find $L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$ by using convolution theorem. **(07 Marks)**

c. Express $f(t) = \begin{cases} \sin t, & 0 \le t < \pi \\ \sin 2t, & \pi \le t < 2\pi \\ \sin 3t, & t \ge 2\pi \end{cases}$

in terms of unit step function and hence find its Laplace Transform. **(07 Marks)**

Module-2

3 a. Obtain fourier series for the function $f(x) = |x|$ in $(-\pi, \pi)$ **(06 Marks)**

b. Expand $f(x) = \frac{(\pi - x)^2}{4}$ as a Fourier series in the interval $(0, 2\pi)$ and hence deduce that

$$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots\ldots\ldots$$ **(07 Marks)**

c. Express y as a Fourier series upto the second harmonic given :

x:	0	60	120	180	240	300
y:	4	3	2	4	5	6

(07 Marks)

OR

4 a. Find the Half-Range sine series of $\pi x - x^2$ in the interval $(0, \pi)$ **(06 Marks)**

b. Obtain fourier expansion of the function $f(x) = 2x - x^2$ in the interval $(0, 3)$. **(07 Marks)**

c. Obtain the Fourier expansion of y upto the first harmonic given :

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(07 Marks)

Module-3

5 a. If $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$, find the Fourier transform of f(x) and hence find the value of $\int_0^\infty \frac{\sin x}{x}\,dx$ **(06 Marks)**

b. Find the infinite Fourier cosine transform of $e^{-\alpha x}$. **(07 Marks)**

c. Solve using z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0, y_1 = 2$ **(07 Marks)**

OR

6 a. Find the fourier sine transform of $f(x) = e^{-|x|}$ and hence evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2}\,dx$; $m > 0$. **(06 Marks)**

b. Obtain the z-transform of $\cos n\theta$ and $\sin n\theta$. **(07 Marks)**

c. Find the inverse z-transform of $\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$ **(07 Marks)**

Module-4

7 a. Solve $\frac{dy}{dx} = x^3 + y$, $y(1) = 1$ using Taylor's series method considering up to fourth degree terms and find y(1.1). **(06 Marks)**

b. Given $\frac{dy}{dx} = 3x + \frac{y}{2}$, $y(0) = 1$ compute y(0.2) by taking h = 0.2 using Runge – Kutta method of fourth order. **(07 Marks)**

c. If $\frac{dy}{dx} = 2e^x - y$, $y(0) = 2$, $y(0.1) = 2.010$, $y(0.2) = 2.040$ and $y(0.3) = 2.090$, find y(0.4) correct to 4 decimal places using Adams-Bashforth method. **(07 Marks)**

OR

8 a. Use fourth order Runge-Kutta method, to find y(0.8) with h = 0.4, given $\frac{dy}{dx} = \sqrt{x+y}$, $y(0.4) = 0.41$ **(06 Marks)**

b. Use modified Euler's method to compute y(20.2) and y(20.4) given that $\frac{dy}{dx} = \log_{10}\left(\frac{x}{y}\right)$ with $y(20) = 5$ Taking h = 0.2. **(07 Marks)**

c. Apply Milne's predictor-corrector formulae to compute y(2.0) given $\frac{dy}{dx} = \frac{x+y}{2}$ with

x	0.0	0.5	1.0	1.5
y	2.000	2.6360	3.5950	4.9680

(07 Marks)

Module-5

9 a. Using Runge-Kutta method, solve

$\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$, for x = 0.2, correct to four decimal places, using initial conditions $y(0) = 1, y'(0) = 0$ **(07 Marks)**

b. Derive Euler's equation in the standard form viz, $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$ **(07 Marks)**

c. Find the extremal of the functional $\int_{x_1}^{x_2}(y^2 + y'^2 + 2ye^x)\,dx$ **(06 Marks)**

OR

10 a. Given the differential equation $2\frac{d^2y}{dx^2} = 4x + \frac{dy}{dx}$ and the following table of initial values:

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514
y′	2	2.3178	2.6725	2.0657

Compute y(1.4) by applying Milne's Predictor-corrector formula. **(07 Marks)**

b. Prove that geodesics of a plane surface are straight lines. **(07 Marks)**

c. On what curves can the functional $\int_0^1 (y'^2 + 12xy)\,dx$ with y(0) = 0, y(1) = 1 can be extremized? **(06 Marks)**

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18MATDIP31

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Find the modulus and amplitude of the complex number : $\frac{(2-3i)(2+i)^2}{1+i}$. **(07 Marks)**

b. Prove that $\left(\frac{1+\cos\theta+i\sin\theta}{1+\cos\theta-i\sin\theta}\right)^n = \cos n\theta + i\sin n\theta$. **(06 Marks)**

c. Show that the vectors $\vec{a}-2\vec{b}+3\vec{c}$, $-2\vec{a}+3\vec{b}-4\vec{c}$, $-\vec{b}+2\vec{c}$ are coplanar. **(07 Marks)**

OR

2 a. Given $\vec{a}=2\hat{i}+2\hat{j}-\hat{k}$, $\vec{b}=6\hat{i}-3\hat{j}+2\hat{k}$. Find : i) $\vec{a}\cdot\vec{b}$ ii) $\vec{a}\times\vec{b}$ iii) $|\vec{a}\times\vec{b}|$. **(07 Marks)**

b. Determine the value of λ, so that $\vec{a}=2\hat{i}+\lambda\hat{j}-\hat{k}$, and $\vec{b}=4\hat{i}-2\hat{j}-2\hat{k}$, are perpendicular. **(06 Marks)**

c. Express $1-i\sqrt{3}$ in the polar form and hence find its modulus and amplitude. **(07 Marks)**

Module-2

3 a. Using Euler's theorem, prove that $xu_x + yu_y = -3\cot u$ where $u = \sin^{-1}\left(\frac{x^2y^2}{x+y}\right)$. **(07 Marks)**

b. Using Maclaurin's series, prove that $\sqrt{1+\sin 2x} = 1+x-\frac{x^2}{2}-\frac{x^3}{3}+\frac{x^4}{24}+\ldots\ldots$. **(06 Marks)**

c. If $u = x + 3y^2$, $v = 4x^2yz$, $w = 2z^2 - xy$, evaluate $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ at the point $(1, -1, 0)$. **(07 Marks)**

OR

4 a. Obtain Maclaurin's series expansion for the function e^x upto x^4. **(07 Marks)**

b. If $u = \sin^{-1}\left[\frac{x^3+y^3}{x+y}\right]$ prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=2\tan u$. **(06 Marks)**

c. If $u = f\left(\frac{x}{y},\frac{y}{z},\frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}=0$. **(07 Marks)**

Module-3

5 a. A particle moves along the curve $x = (1 - t^3)$, $y = (1 + t^2)$, $z = (2t - 5)$ determine its velocity and acceleration at $t = 1$ sec. **(07 Marks)**

b. If $\vec{F}=2x^2\hat{i}-3yz\hat{j}+xz^2\hat{k}$, and $\phi = 2z - x^3y$, find $\vec{F}\cdot(\nabla\phi)$ and $\vec{F}\times(\nabla\phi)$ at $(1, -1, 1)$. **(06 Marks)**

c. Find the constants a, b, c so that $\vec{f}=(x+2y+az)\hat{i}+(bx-3y-z)\hat{j}+(4x+cy+2z)\hat{k}$ is irrotational. **(07 Marks)**

OR

6 a. Find the directional derivate of $\phi = x^2yz + 4xz^2$ at $(1,-2,-1)$ along $\vec{a} = 2\hat{i} - \hat{j} - 2\hat{k}$ **(07 Marks)**

b. Find curl $\vec{f}$ given that $\vec{f} = xyz^2\hat{i} + xy^2z\hat{j} + x^2yz\hat{k}$. **(06 Marks)**

c. If $\vec{f} = x^2i + y^2j + z^2k$ and $\vec{g} = yzi + zxj + xyk$. Show that $\vec{f} \times \vec{g}$ is a solenoidal vector. **(07 Marks)**

Module-4

7 a. Obtain the reduction formula, $I_n = \int \cos^n x dx$, where n is a positive integer. **(07 Marks)**

b. Evaluate $\int_0^1 \int_x^{\sqrt{x}} xydydx$. **(06 Marks)**

c. Evaluate $\int_0^1 \int_0^1 \int_0^1 (x+y+z)dxdydz$. **(07 Marks)**

OR

8 a. Evaluate : $\int_0^{\pi/6} \sin^6(3x)dx$. **(07 Marks)**

b. Evaluate : $\int_0^{\pi} x \sin^4 x \cos^6 x \, dx$. **(06 Marks)**

c. Evaluate $\int_0^1 \int_0^1 \int_0^y xyz \, dxdydz$. **(07 Marks)**

Module-5

9 a. Solve : $(2x + y + 1)\,dx + (x + 2y + 1)\,dy = 0$. **(07 Marks)**

b. Solve : $(4xy + 3y^2 - x)\,dx + (x^2 + 2xy)\,dy = 0$. **(06 Marks)**

c. Solve : $y(2xy + e^x)\,dx - e^x\,dy = 0$. **(07 Marks)**

OR

10 a. Solve : $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$. **(07 Marks)**

b. Solve : $y(2xy + 1)dx - x\,dy = 0$. **(06 Marks)**

c. Solve : $\frac{dy}{dx} + y\cot x = \cos x$. **(07 Marks)**

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18EC32

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Network Theory

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Determine current through 12Ω resistor shown in Fig.Q1(a), using source transformation.

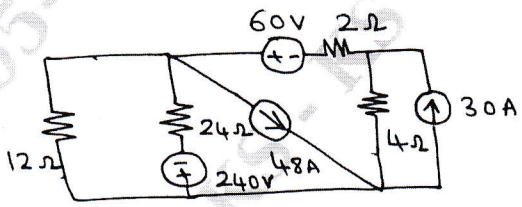

Fig.Q1(a) **(08 Marks)**

b. Find the equivalent resistance of the circuit shown in Fig.Q1(b), using star delta transformation.

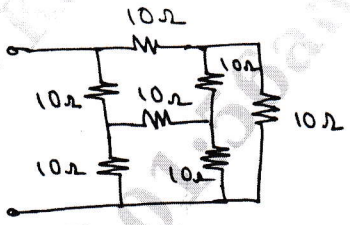

Fig.Q1(b) **(08 Marks)**

c. Discuss the dependent sources. **(04 Marks)**

OR

2 a. Using loop analysis, find the current through 10Ω resistor for the circuit shown in Fig.Q2(a).

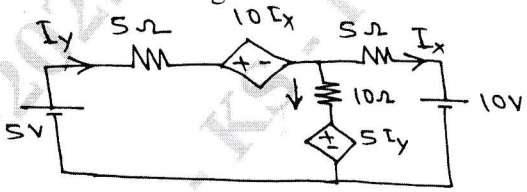

Fig.Q2(a) **(08 Marks)**

b. For the network shown in Fig.Q2(b), determine node voltages V_1, V_2, V_3 and V_4 using nodal analysis.

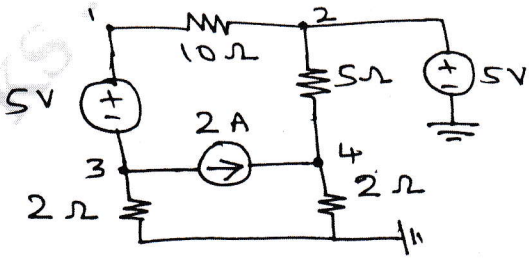

Fig.Q2(b) **(08 Marks)**

c. Explain the super Mesh with example. **(04 Marks)**

Module-2

3 a. Using super position theorem, find the current through 20Ω resistor shown in Fig.Q3(a).

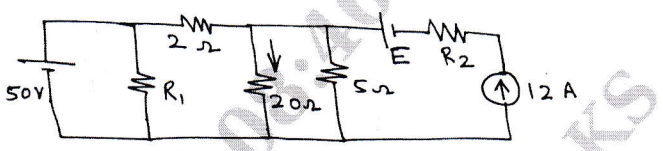

Fig.Q3(a) **(08 Marks)**

b. Using Millman's theorem, determine the current through (2 + j2)Ω impedance for the network shown in Fig.Q3(b).

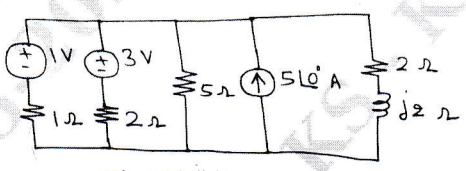

Fig.Q3(b) **(08 Marks)**

c. State the Norton's theorem and also write the procedure to be followed for solving the problem. **(04 Marks)**

OR

4 a. What should be the value of R such that maximum power transfer can takes place from the rest of the network to R. Obtain the amount of this power for circuit shown in Fig.Q4(a).

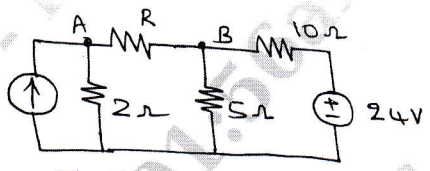

Fig.Q4(a) **(08 Marks)**

b. Obtain the Thevinin's equivalent circuit cross AB for the circuit shown in Fig.Q4(b).

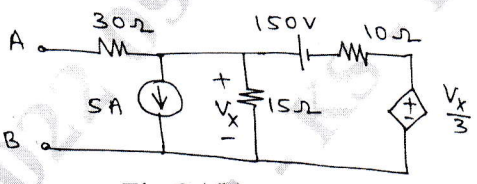

Fig.Q4(b) **(08 Marks)**

c. State the maximum power transfer theorem and also write equation of P_{max} for both DC and AC circuits. **(04 Marks)**

Module-3

5 a. Explain the transient behavior of the resistance, inductance and capacitor. Also write the procedure for evaluating transient behavior. **(10 Marks)**

b. In the network shown in Fig.Q5(b), a steady state is reached with the swatch 'K' open. At t = 0 the switch is closed. Determine the value of $V_a(0^+)$ and $V_a(0^-)$.

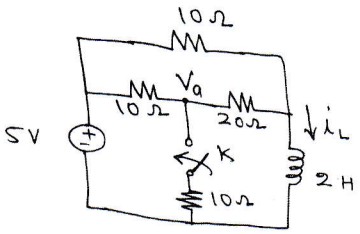

Fig.Q5(b) **(10 Marks)**

OR

6 a. For the network shown in Fig.Q6(a) $V_1(t) = e^{-t}$ for $t \geq 0$ and is zero for all $t < 0$. If the capacitor is initially uncharged determine the value of $\frac{d^2v_2}{dt^2}$ and $\frac{d^3v_2}{dt^3}$ at $t = 0^+$.

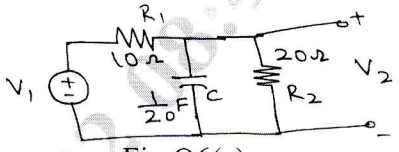

Fig.Q6(a) **(10 Marks)**

b. The switch 'S' is changed from position 1 to position 2 at $t = 0$. Steady state conditions have been reached in position 1. Find the value of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ for the circuit shown in Fig.Q6(b).

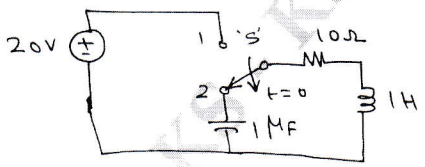

Fig.Q6(b) **(10 Marks)**

Module-4

7 a. Find the Laplace transform of f(t) shown in Fig.Q7(a).

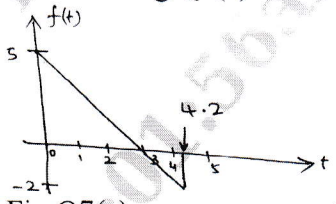

Fig.Q7(a) **(10 Marks)**

b. Find the Lapalce transform of the pulse shown in Fig.Q7(b).

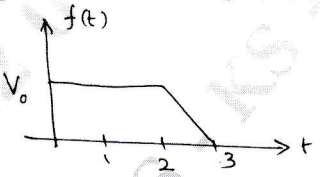

Fig.Q7(b) **(10 Marks)**

OR

8 a. Find i(t) for the circuit shown in Fig.Q8(a).

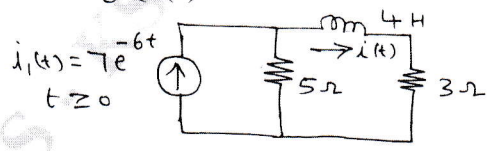

Fig.Q8(a) **(10 Marks)**

b. A voltage pulse of 10V and 5μsec duration is applied to the RC network shown in Fig.Q8(b). Find the current i(t).

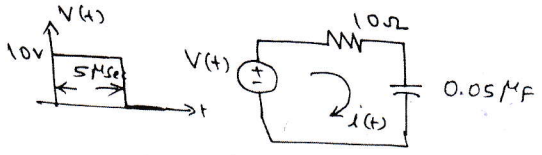

Fig.Q8 (b) **(10 Marks)**

Module-5

9 a. Obtain y-parameters interms of z-parameters and h-parameters. **(10 Marks)**

b. For the network shown in Fig.Q9(b), find the T-parameters.

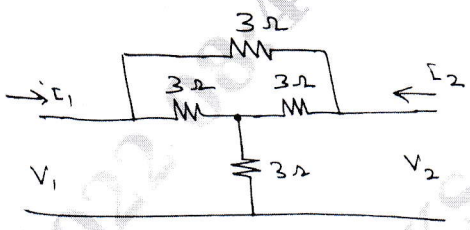

Fig.Q9(b) **(10 Marks)**

OR

10 a. Derive the expression of bandwidth, half power frequencies and selectivity of a series resonance circuit. **(10 Marks)**

b. For the parallel resonant circuit shown in Fig.Q10(b), find I_0, I_L, I_C, f_0 and dynamic resistance.

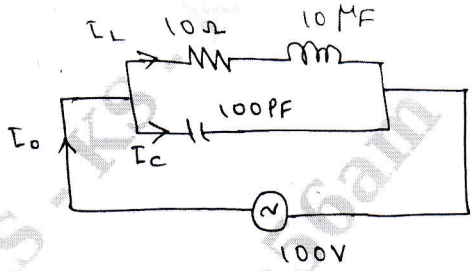

Fig.Q10(b) **(10 Marks)**

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18EC33

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Electronic Devices

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain classification of semiconductor insulator and metals using energy band diagram. **(08 Marks)**

b. Explain different types of bonding forces in solids. **(04 Marks)**

c. What are intrinsic and extrinsic materials? Explain briefly by taking suitable example. **(08 Marks)**

OR

2 a. Define Hall effect in semiconductor. Obtain an expression for mobility interms of Hall coefficient and resistivity. **(08 Marks)**

b. Consider a semiconductor bar with width w = 0.1 mm, thickness t = 10 μm, length L = 5 mm. For B = 10 KG (1 KG = 10^{-5} wb/cm^2) and current of 1 mA. We have $V_{AB} = -2$mV and $V_{CD} = 100$ mV. Find the type, concentration and mobility of the majority carrier. [Refer Fig.Q2(b)]

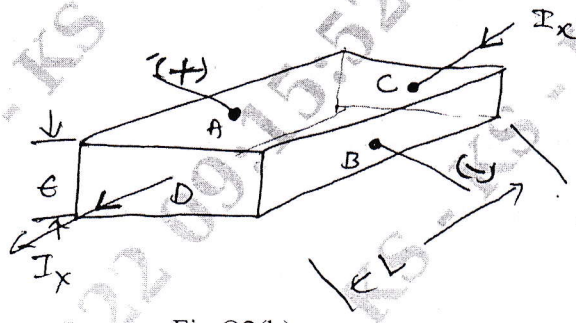

Fig.Q2(b) **(04 Marks)**

c. Derive an expression for conductivity and mobility from random thermal motion or electron in solid. **(08 Marks)**

Module-2

3 a. Explain the reverse bias p-n junction indicating the minority carrier distribution and variation of quasi fermi levels. **(10 Marks)**

b. With a neat diagram, explain in detail Avalanche Breakdown and derive an approximate analysis of avalanche multiplication. **(10 Marks)**

OR

4 a. Derive an expression for current and voltage for an illuminated junction of protodiode and discuss the operation in various quadrants in I-V characteristic. **(08 Marks)**

b. Explain the structure and operation of solar cell. Indicate the significance of Fill Factor. **(08 Marks)**

c. A solar cell has a short circuit current of 100 mA and open circuit voltage of 0.8 V under full solar illumination fill factor is 0.7. What is maximum power delivered to load by this cell? **(04 Marks)**

Module-3

5 a. Explain the summary of hole flow and electron flow in p-n-p transistor with proper biasing and list three dominant mechanism which accounts for I_B. **(10 Marks)**

b. Explain the process flow for double polysilicon self aligned BJT Fabrication. **(10 Marks)**

OR

6 a. Derive Eber's moll modes for Assymetric Transistor (coupled diode model). **(10 Marks)**

b. Write short notes on: (i) Base narrowing (ii) Avalanche Breakdown in transistor **(10 Marks)**

Module-4

7 a. Explain the structure and operation of pn JFET by varying V_{GS} and VDS independently. **(06 Marks)**

b. Write the small signal equivalent circuit of JFET and obtain the expression for transconductance (gm) and plot the graph with respect to V_{gs}. **(06 Marks)**

c. Explain the operation of MOS capacitor using energy band diagram for p-type substrate when:
(i) Negative gate bias
(ii) Moderate positive gate bias
(iii) Large positive gate bias **(08 Marks)**

OR

8 a. Explain the ideal capacitance voltage characteristics of an MOS capacitor with p-type substrate. **(08 Marks)**

b. Explain the operation of n-channel enhancement MOSFET and obtain the current voltage relationship. **(08 Marks)**

c. Write the different types of MOS structures and symbols for each. **(04 Marks)**

Module-5

9 Explain briefly the various steps involved in the fabrication of p-n junction:

a. Rapid thermal processing **(05 Marks)**

b. Ion implementation **(05 Marks)**

c. Chemical Vapor Deposition (CVD) **(05 Marks)**

d. Photolithography **(05 Marks)**

OR

10 a. Write a note on Integrated Circuit (IC) and its advantages and types of ICs. **(10 Marks)**

b. Explain the fabrication of CMOS twin well process. **(10 Marks)**

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CBCS SCHEME

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18EC34

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Digital System Design

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define and explain the combinational logic circuit along with block diagram. **(06 Marks)**

b. Develop the canonical minterm and maxterm forms in decimal notation for the following Boolean functions:

i) $X = f(a, b, c, d) = \bar{a}b + c\bar{d}$

ii) $Y = f(a, b, c) = (\bar{a} + b)(b + \bar{c})$ **(08 Marks)**

c. Simplify the following function using K-map method and also construct logic circuit for the simplified equation (function).

$Y = f(a, b, c, d) = \sum(0, 1, 2, 4, 5, 6, 8, 9, 10, 12, 13, 14)$. **(06 Marks)**

OR

2 a. Simplify the following Boolean function by using Q-M method:

$X = f(a, b, c) = \sum(0, 1, 2, 3, 4, 5, 6)$. **(10 Marks)**

b. Design a combinational logic circuit for valid single digit BCD data, the output is 1 whenever a number is greater than 5 appears at the input. **(05 Marks)**

c. Identify the PI and EPI for the following function:

$M = f(a, b, c, d) = \sum(1, 2, 3, 5, 7, 11, 12, 13, 14, 15)$. **(05 Marks)**

Module-2

3 a. Draw and explain the circuit for 3 to 8 decoder. **(06 Marks)**

b. Design and implement a full adder circuit using logic gates. **(08 Marks)**

c. Write a short notes on PLD's and FPGA. **(06 Marks)**

OR

4 a. Define MUX and explain 4:1 MUX with the help of logic diagram using gates. **(06 Marks)**

b. Explain 4-bit carry look-ahead adder with diagram. **(08 Marks)**

c. Design and implement 1-bit comparator circuit. **(06 Marks)**

Module-3

5 a. Compare sequential circuit and combinational circuits. **(06 Marks)**

b. Write a short notes on SR-latch. **(06 Marks)**

c. Illustrate master-slave J-K flip-flop using NAND Gates. **(08 Marks)**

OR

6 a. Distinguish between synchronous and asynchronous counter. **(06 Marks)**

b. Explain 4-bit universal shift register along with diagram. **(08 Marks)**

c. Explain the working of clocked SR-FF using NAND Gates. **(06 Marks)**

Module-4

7 a. Explain Mealy and Moore model with diagrams. **(10 Marks)**

b. Design and develop Mod-6 synchronous counter using T-FF. **(10 Marks)**

OR

8 a. Construct the excitation table, transition table, state table and state diagram for the following sequential circuit. (Refer Fig.Q.8(a)). **(14 Marks)**

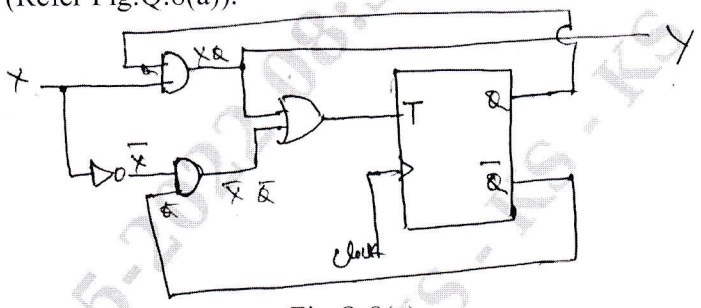

Fig.Q.8(a)

b. List out the applications of shift registers along with brief explanation. **(06 Marks)**

Module-5

9 a. Explain the operation of serial adder with accumulator. **(12 Marks)**

b. Illustrate state assignment rules. **(08 Marks)**

OR

10 a. Write a short notes on:

i) Sequential circuit design steps

ii) BCD to Ex-3 code convertor. **(10 Marks)**

b. Explain 4-bit Ring and Johnson counter along with diagram. **(10 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

18EC35

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Computer Organization and Architecture

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the basic operational concept between the processor and memory with neat block diagram. **(08 Marks)**

b. Explain the various parameters affecting the performance of a computer and also provide the basic performance equation. **(08 Marks)**

c. Write a short note on single bus structure with neat diagram. **(04 Marks)**

OR

2 a. List out and explain the three systems used for representing signed numbers and also brief about the modular number system concept. **(08 Marks)**

b. Explain IEEE standard used for single and double precession floating point number representation with examples. **(08 Marks)**

c. Write a short note on Big-endian and little-endian assignment. **(04 Marks)**

Module-2

3 a. What is addressing mode? Explain any four addressing modes with examples. **(08 Marks)**

b. What are assembler directives? Explain about the various directives used in the program with example. **(08 Marks)**

c. Write a short note on the assembly and execution of programs. **(04 Marks)**

OR

4 a. With neat diagram and program example, explain a simple I/O task between processor, keyboard and display. **(10 Marks)**

b. What is subroutine? Illustrate the subroutine function with parameter passing by value and reference with suitable program. **(10 Marks)**

Module-3

5 a. Explain the concept of memory mapped I/O with neat diagram of I/O interface with program example. **(10 Marks)**

b. Write short notes on: (i) Interrupt hardware (ii) Interrupt nesting **(10 Marks)**

OR

6 a. What is an interrupt? Explain about various implementation techniques of interrupt. **(10 Marks)**

b. Explain how simultaneous interrupt request is handled using the concept of Daisy Chain. **(10 Marks)**

Module-4

7 a. Explain the internal organization of memory chips with example. **(08 Marks)**

b. Explain the internal organization of 2M × 8 DRAM chip with neat diagram. **(08 Marks)**

c. Write a short note on ROM. **(04 Marks)**

OR

8 a. Discuss about the use of cache memory in the processor system. **(08 Marks)**
b. What is virtual memory? Explain its organization with neat diagram. **(08 Marks)**
c. Write a short note on magnetic hard disk. **(04 Marks)**

Module-5

9 a. Explain single-bus organization of the data path inside a processor with neat diagram. **(10 Marks)**
b. Explain the process of fetching a data word from memory using respective registers of a processor with neat diagram. **(10 Marks)**

OR

10 a. Explain the control signal generation required for proper sequence of instructions in the processor. **(10 Marks)**
b. What is microprogrammed control? Explain its basic organization with suitable diagram and example. **(10 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

18EC36

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Power Electronics and Instrumentation

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Mention the different types of power electronic converters. Explain the significance, functions and applications of them. **(07 Marks)**

b. Explain the static Anode-Cathode characteristics of SCR with circuit diagram and V-I characteristics. **(08 Marks)**

c. Explain the basic operation of the unijunction transistor with basic UJT structure, UJT symbol and equivalent circuit. **(05 Marks)**

OR

2 a. Mention the applications of power electronics in various sectors. **(07 Marks)**

b. The latching current of a thyristor circuit is 50mA. The duration of the firing pulse is 50μs. Will the thyristor get fired? **(05 Marks)**

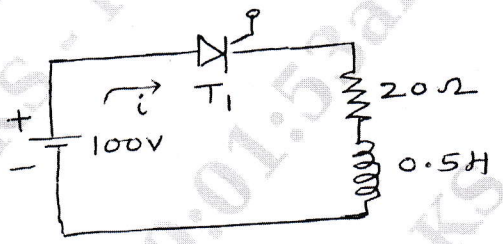

Fig.Q.2(b)

c. Explain the operation of the resistance firing circuit with associated voltage waveforms. Derive the relevant expressions. **(08 Marks)**

Module-2

3 a. Explain the operation of the single phase half wave controlled rectifier with resistive load using circuit and waveforms. **(10 Marks)**

b. Give basic chopper classification with different chopper configurations. **(05 Marks)**

c. A dc chopper circuit connected to a 100V dc source supplies an inductive load having 40mH in series with a resistance of 5Ω. A freewheeling diode is placed across the load. The load current varies between the limits of 10A and 12A. Determine the time ratio of the chopper. **(05 Marks)**

OR

4 a. Explain the effect of freewheeling diode with half wave controlled rectifier circuit and waveforms using inductive load. **(10 Marks)**

b. Explain the operation of step-up/down choppers with suitable circuit. Derive the relevant expression. **(07 Marks)**

c. A step-up chopper is used to deliver load voltage of 500V from a 220V dc source. If the blocking period of the thyristor is 80μs. Compute the required pulse-width. **(03 Marks)**

Module-3

5 a. Explain the operation of the single phase half bridge inverter with RL load. Draw the relevant circuit and waveforms. **(10 Marks)**

b. Explain the operation of the isolated forward converter with suitable circuit diagram and relevant waveforms. Mention the advantages and disadvantages. **(10 Marks)**

OR

6 a. Explain the types of errors in measurements. **(07 Marks)**

b. Explain the operation of the multirange voltmeter with normal circuit and with multipliers connected in series string circuit. **(07 Marks)**

c. A 1mA meter movement having an internal resistance of 100Ω is used to convert into a multirange ammeter having the range 0-10mA, 0-20mA, and 0-30mA. Determine the value of the shunt resistance required. **(06 Marks)**

Module-4

7 a. Explain the operation of dual slope integrating type DVM with basic principles and suitable block-diagram. **(08 Marks)**

b. With suitable block diagram, explain the operation of measurement of time briefly. **(07 Marks)**

c. A capacitance comparison bridge is used to measure a capacitive impedance at a frequency of 2kHz. This bridge constants at balance are c_3 = 100μF, R_1 = 10KΩ, R_2 = 50KΩ, R_3 = 100KΩ. Find the equivalent series circuit of the unknown capacitance. **(05 Marks)**

OR

8 a. With suitable block diagram and table explain the operation of successive approximation DVM. **(08 Marks)**

b. With suitable block diagram approach explain the operation of the digital frequency meter. **(07 Marks)**

c. Find the equivalent parallel resistance and capacitance that causes a Wien bridge to null with the following component values R_1 = 3.1KΩ, C_1 = 5.2μF, R_2 = 25KΩ, f = 2.5kHz, R_4 = 100KΩ. **(05 Marks)**

Module-5

9 a. Explain the operation of the resistive position transducer with construction and electrical equivalent circuit. **(07 Marks)**

b. In the differential instrumentation amplifier using transducer bridge, R_1 = 2.2K, R_F = 10K, R_A= R_B = R_C = 120K, E = +5V and op-amp supply voltage = ±15V, the transducer is a transistor with the following specifications. R_T = 120K at a reference temperature of 25°C. Temperature coefficient of resistance = -1K/°C. Determine the output voltage at 0°C and 100°C. **(06 Marks)**

c. Explain the PLC structure with block diagram. And also explain the PLC operation with PLC operation diagram. **(07 Marks)**

OR

10 a. Explain the operation of the LVDT with construction, various core positions of it, and variation of output voltage vss displacement. **(10 Marks)**

b. What is the significance of analog weight scale? Using strain gauge bridge circuit for analog weight scale explain its operation briefly. **(05 Marks)**

c. With Bell circuit diagram, explain the operation of the Programmable Logic Controller (PLC) relays. **(05 Marks)**

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