CBCS SCHEME

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Third Semester B.E. Degree Examination, July/August 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. Find the Laplace transform,
(i) $e^{-2t}(2\cos 5t - \sin 5t)$ (ii) $\cosh^2 3t$ **(06 Marks)**

b. Find the Laplace transform of the full wave rectifier $f(t) = E\sin\omega t \quad 0 < t < \frac{\pi}{\omega}$ having a period $\frac{\pi}{\omega}$. **(07 Marks)**

c. Find the inverse Laplace transform $\left[\frac{s^2+4}{s(s+4)(s-4)}\right]$. **(07 Marks)**

OR

2 a. Find the Laplace transform, $\frac{\cos at - \cos bt}{t}$. **(06 Marks)**

b. Solve by using Laplace transform method $y'''(t) + 2y''(t) - y'(t) - 2y(t) = 0$, given $y(0) = y'(0) = 0$ and $y''(0) = 6$ **(07 Marks)**

c. Express the function f(t) in terms of unit step function and hence find its inverse LT,

$$f(t) = \begin{cases} \cos t & 0 < t \le \pi \\ 1 & \pi < t \le 2\pi \\ \sin t & t > 2\pi \end{cases}$$ **(07 Marks)**

Module-2

3 a. Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$, in $0 < x < 2\pi$. Hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots = \frac{\pi}{4}$. **(06 Marks)**

b. Show that the sine half range series for the function, $f(x) = Lx - x^2$, in $0 < x < L$ is $\frac{8L^2}{\pi^3}\sum_0^\infty \frac{1}{(2n+1)^3}\sin\left(\frac{2n+1}{L}\right)\pi x$. **(07 Marks)**

c. Obtain the Fourier series of y up to the first harmonics for the following values :

x°	45	90	135	180	225	270	315	360
y	4.0	3.8	2.4	2.0	−1.5	0	2.6	3.4

(07 Marks)

OR

4 a. Expand the function $f(x) = x\sin x$, as a Fourier series in the interval $-\pi \le x \le \pi$. Deduce that $\frac{1}{1,3} - \frac{1}{3,5} + \frac{1}{5,7} ..... = \frac{\pi - 2}{4}$ **(06 Marks)**

b. Obtain the half range cosine series of $f(x) = x\sin x \quad 0 \le x \le \pi$. **(07 Marks)**

c. Obtain the constant term and the first three coefficients in the Fourier cosine series for y using the following data :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

(07 Marks)

Module-3

5 a. Find the complex Fourier transform of the function, $f(x) = \begin{cases} 1 & \text{for } |x| \le a \\ 0 & \text{for } |x| > a \end{cases}$.

Hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$. **(06 Marks)**

b. If $\overline{f(z)} = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3 **(07 Marks)**

c. Solve by using z-transforms, $u_{n+2} + 5u_{n+1} + 6u_n = 2^n : u_1 = 0, u_0 = 0$ **(07 Marks)**

OR

6 a. Find the Fourier sine transform of e^{-ax}, $a > 0$. **(06 Marks)**

b. Find the Fourier sine and cosine transform of $2e^{-3x} + 3e^{-2x}$. **(07 Marks)**

c. Solve by using Z-transforms,
$y_{n+2} + 2y_{n+1} + y_n = n$, with $y(0) = 0 = y_1$ **(07 Marks)**

Module-4

7 a. Use Taylor's series method to find y(4.1) given that $\frac{dy}{dx} = \frac{1}{x^2 + y}$ and $y(4) = 4$. **(06 Marks)**

b. Use Fourth order Runge-Kutta method to solve $(x+y)\frac{dy}{dx} = 1$, $y(0.4) = 1$ at $x = 0.5$. Correct to four decimal places. **(07 Marks)**

c. The following table gives the solution of $5xy' + y^2 - 2 = 0$, find the value of y at x = 4.5 using Milne's Predictor and Corrector formulae, use the corrector formulae twice.

x	4	4.1	4.2	4.3	4.4
y	1	1.0049	1.0097	1.0143	1.0187

(07 Marks)

OR

8 a. Using modified Euler's method find y at x = 0.2 given $\frac{dy}{dx} = 3x + \frac{y}{2}$, with $y(0) = 1$ taking $h = 0.1$. **(06 Marks)**

b. Using Runge-Kutta method of fourth order find y(0.2) for the equation $\frac{dy}{dx} = \frac{y - x}{y + x}$, $y(0) = 1$ taking $h = 0.2$ **(07 Marks)**

c. Apply Adams-Bashforth method to solve the equation $(y^2 + 1)dy - x^2 dx = 0$, at x = 1, given y(0) = 1, y(0.25) = 1.0026, y(0.5) = 1.0206, y(0.75) = 1.0679. Apply the corrector formulae twice. **(07 Marks)**

Module-5

9 a. Given $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} - 2xy = 1$, $y(0) = 1$, $y'(0) = 0$, Evaluate $y(0.1)$ using Runge-Kutta method of order 4. **(06 Marks)**

b. A necessary condition for the integral $I = \int_{x_1}^{x_2} f(x, y, y')dx$ where $y(x_1) = y_1$ and $y(x_2) = y_2$ to be extremum that $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$. **(07 Marks)**

c. Show that the extremal of the functional $\int_0^1 y^2\{3x(y'^2 - 1) + yy'^3\}dx$, subject to the conditions $y(0) = 0$, $y(1) = 2$, is the circle $x^2 + y^2 - 5x = 0$. **(07 Marks)**

OR

10 a. Apply Milne's method to compute $y(0.8)$. Given that $\frac{d^2y}{dx^2} = 1 - 2y\frac{dy}{dx}$ and the following table of initial values. **(06 Marks)**

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y'	0	0.1996	0.3937	0.5689

b. Find the extremal of the functional $\int_a^b (x^2y'^2 + 2y^2 + 2xy)dx$. **(07 Marks)**

c. Prove that Geodesics on a plane are straight line. **(07 Marks)**

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CBCS SCHEME

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18MATDIP31

Third Semester B.E. Degree Examination, July/August 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. Express $\frac{(3+i)(1-3i)}{(2+i)}$ in the form x + iy. **(06 Marks)**

b. If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$. Find the value of 'ρ' such that $\vec{a} - \rho\vec{b}$ is perpendicular to $\vec{c}$. **(07 Marks)**

c. Find the angle between the vector $\vec{a} = 5\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 3\hat{j} + 6\hat{k}$. **(07 Marks)**

OR

2 a. Find the modulus and amplitude of the complex number $1 + \cos\alpha + i\sin\alpha$. **(06 Marks)**

b. Prove that $\left(\frac{1+\cos\theta+i\sin\theta}{1+\cos\theta-i\sin\theta}\right)^n = \cos n\theta + i\sin n\theta$. **(07 Marks)**

c. Find the sine of the angle between $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$. **(07 Marks)**

Module-2

3 a. Find the n^{th} derivative of cosx cos2x. **(06 Marks)**

b. Obtain the Maclaurin's series expansion of the function $\sqrt{1+\sin 2x}$ upto the term containing x^4. **(07 Marks)**

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

OR

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

b. If $z = xy^2 + x^2y$ where $x = at^2$ and $y = 2at$. Find $\frac{dz}{dt}$. **(07 Marks)**

c. If $x = e^u \sec v$, $y = e^u \tan v$. Find $J\left(\frac{x,y}{u,v}\right)$. **(07 Marks)**

Module-3

5 a. A particle moves along the curve $\vec{r} = \cos 2t\hat{i} + \sin 2t\hat{j} + t\hat{k}$ where t is the time variable. Determine the components of velocity and acceleration vectors at t = π/8 in the direction of $\sqrt{2}\hat{i} + \sqrt{2}\hat{j} + \hat{k}$. **(06 Marks)**

b. Find div $\vec{f}$ for $\vec{f} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. **(07 Marks)**

c. Show that $\vec{f} = (2xy + z^2)\hat{i} + (x^2 + 2yz)\hat{j} + (y^2 + 2xz)\hat{k}$ is irrotional and find φ such that $\vec{f} = \nabla\varphi$. **(07 Marks)**

OR

6 a. Find the unit normal to the surface $x^3y^3z^2 = 4$ at the point P(-1, -1, 2). **(06 Marks)**

b. If $\vec{f} = 2x^2\hat{i} - 3yz\hat{j} + xz^2\hat{k}$ and $\varphi = 2z - x^3y$, find $\vec{f} \bullet (\nabla\varphi)$ and $\vec{f} \times (\nabla\varphi)$ at (1, -1, 1). **(07 Marks)**

c. Show that $\vec{f} = \dfrac{xi + yj}{x^2 + y^2}$ is both solenoidal and irrotational. **(07 Marks)**

Module-4

7 a. Obtain a reduction formula for $\int_0^{\pi/2} \sin^n x\, dx\ (n > 0)$. **(06 Marks)**

b. Evaluate $\int_0^{2a} x^2\sqrt{2ax - x^2}\, dx$. **(07 Marks)**

c. Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz\, dz\, dy\, dx$. **(07 Marks)**

OR

8 a. Obtain a reduction formula for $\int_0^{\pi/2} \cos^n x\, dx\ (n > 0)$. **(06 Marks)**

b. Evaluate $\iint_R xy\, dx\, dy$ where R is the first quadrant of the circle $x^2 + y^2 = a^2$, $x \geq 0$, $y \geq 0$. **(07 Marks)**

c. Evaluate $\int_{-1}^{1} \int_0^z \int_{x-z}^{x+z} (x + y + z)\, dy\, dx\, dz$. **(07 Marks)**

Module-5

9 a. Solve $x^2\dfrac{dy}{dx} - 2xy - x + 1 = 0$. **(06 Marks)**

b. Solve $(3x^2y^2 + x^2)\,dx + (2x^3y + y^2)\,dy = 0$. **(07 Marks)**

c. Solve $3x(x + y^2)dy + (x^3 - 3xy - 2y^3)dx = 0$. **(07 Marks)**

OR

10 a. Solve $\left[y\left(1 + \dfrac{1}{x}\right) + \cos y\right]dx + [x + \log x - x\sin y]dy = 0$. **(06 Marks)**

b. Solve $\dfrac{dy}{dx} + y\cot x = \sin x$. **(07 Marks)**

c. Solve $\dfrac{dy}{dx} + \dfrac{y}{x} = y^2x$. **(07 Marks)**

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CBCS SCHEME

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18EC32

Third Semester B.E. Degree Examination, July/August 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. Briefly explain the classification of electrical networks. **(10 Marks)**

b. Three resistance are connected in delta obtain the star equivalent of the network. **(05 Marks)**

c. Find the equivalent resistance between any 2 corners. (Ref. Fig Q1(c))

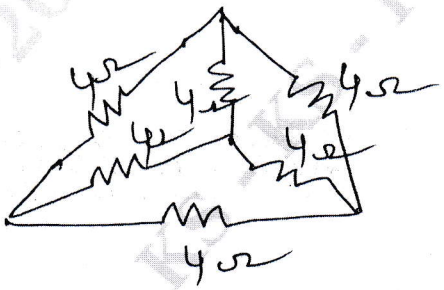

Fig Q1(c) **(05 Marks)**

OR

2 a. Using Mesh current analysis, find the currents in various branches in the circuit. (Ref. Fig Q2(a))

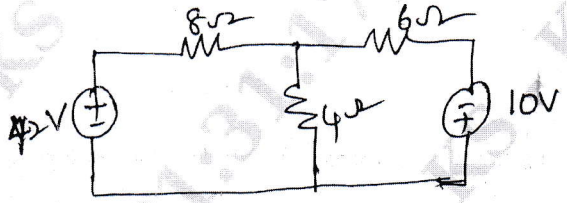

Fig Q2(a) **(10 Marks)**

b. Find the current through the braches using Nodal analysis. (Ref. Fig Q2(b)).

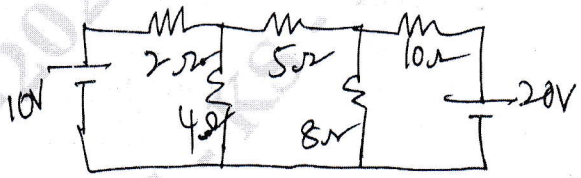

Fig Q2(b) **(10 Marks)**

Module-2

3 a. State and explain Thevenin's theorem. **(10 Marks)**

b. Find the Norton's equivalent for the given Fig Q3(b).

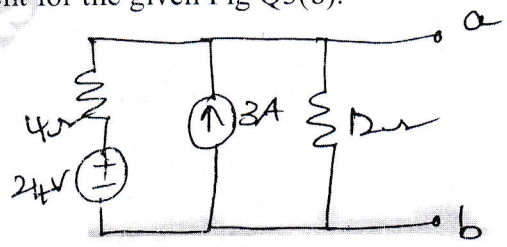

Fig Q3(b) **(10 Marks)**

OR

4 a. State and explain maximum power transfer when load impedance consisting of variable resistance and variable reactant. **(10 Marks)**

b. Using Millman's theorem, find the current flowing through (4+j3) Ω of the circuit as in Fig Q4(a).

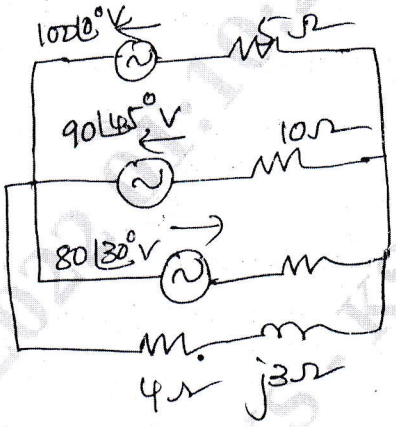

Fig Q4(a) **(10 Marks)**

Module-3

5 a. Discuss the initials and final conditions in inductor, capacitor and resistor. **(10 Marks)**

b. Find $V_c(0^+)$. Assume that the switch was in closed state for a long time. (Ref. Fig Q5(b))

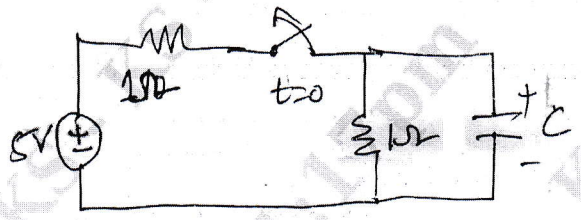

Fig Q5(b) **(10 Marks)**

OR

6 a. In the given network, K is closed at t = 0 with zero current in the inductor. Find the values of i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$, if R = 8Ω and L = 0.2H. (Ref. Fig Q6(a))

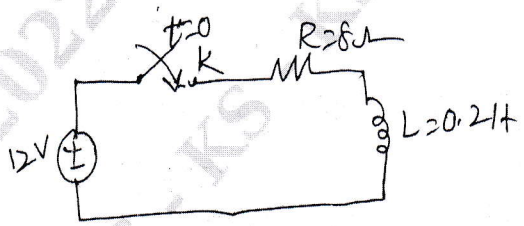

Fig Q6(a) **(10 Marks)**

b. In circuit shown in Fig Q6(b). The switch K is changed from position 1 to position 2 at t = 0. Steady state condition having been reached at position. Find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.

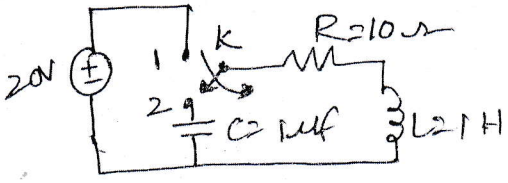

Fig Q6(b) **(10 Marks)**

Module-4

7 a. Obtain the Laplace transform of
i) Unit step function ii) Unit Ramp function iii) Unit impulse function. **(10 Marks)**

b. Find the Laplace transform of following :

(i) $x(t) = 2t\,u(t) - \frac{4d}{dt}\delta(t)$ ii) $x(t) = 5u(t/3)$ iii) $x(t) = 5e^{-t/2}u(t)$ **(10 Marks)**

OR

8 a. Find the Laplace transform for the given Figure Q8(a).

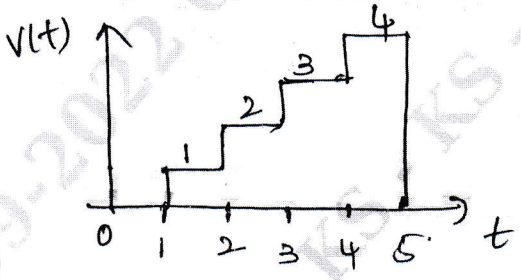

Fig Q8(a) **(10 Marks)**

b. Find the Laplace transform for the Fig Q8(b)

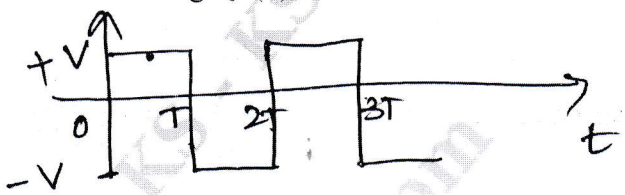

Fig Q8(b) **(10 Marks)**

Module-5

9 a. What is resonance? Derive as expression for half power frequencies in series RLC circuit. Define Q-factor, selectivity and Bandwidth. **(10 Marks)**

b. Find the value of R_L for which, circuit shown below in Fig Q9(b), is resonant.

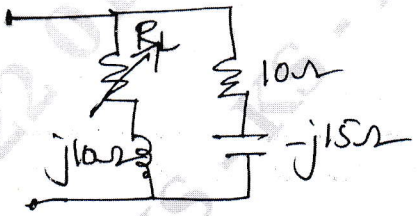

Fig Q9(b) **(10 Marks)**

OR

10 a. Find Y and Z parameters for the network (Ref. Fig Q10(a)).

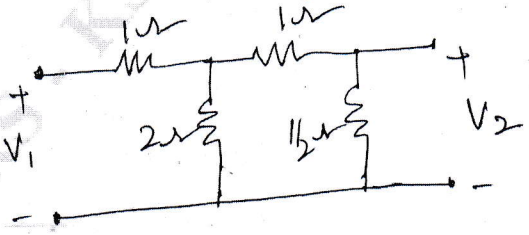

Fig Q10(a) **(10 Marks)**

b. Derive Y parameters in terms of ABCD parameters. **(10 Marks)**

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CBCS SCHEME

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18EC33

Third Semester B.E. Degree Examination, July/August 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. In a filled band, what is the net current density and if a hole is created, what is the net current generated? Describe the superposition of the (E,K) band structure for a semiconductor in an electric field. **(10 Marks)**

b. A Si bar 4 cm long and 500 μm^2 in cross sectional area is doped with $2.5\times10^{18}/cm^3$ phosphorus. Find the current at 300°K with 22 V applied voltage. How long it take an average electron to drift 4 cm in pure silicon at an electric field of 70 V/cm. Calculate the time required at 10^5 V/cm. Assume mobility of the electrons is 0.1675 m^2/Vsec and scattering limited velocity (V_S) in 10^7 cm/sec. **(10 Marks)**

OR

2 a. Show the random thermal motion of an electron in a solid and what happens when electric field is applied? Derive the equation which relates the current density and mobility in a semiconductor in an applied electric field. **(10 Marks)**

b. Consider a semiconductor bar with width = 0.02 cm, thickness = 15 μm and length = 8 mm. For B_Z = 15 kg and a current of 3.5 mA, $V_{AB} = -5$ V, V_{CD} = 400 mV, find the type, concentration and mobility of the majority carrier. **(10 Marks)**

Module-2

3 a. Analyze the effect of a bias at a pn junction on electric field, potential particle flow and current direction at (i) Equilibrium (ii) Forward bias (iii) Reverse bias. **(12 Marks)**

b. Explain the operation of pin photodetector. **(08 Marks)**

OR

4 a. What type of breakdown occurs in a lightly doped pn junction? Show the energy band diagram of a pn junction in a reverse bias, single ionizing collision by an incoming electron in the depletion region and primary, secondary and tertiary collisions. **(10 Marks)**

b. Obtain the relationship between the open circuit voltage and optical generation rate starting from the expression for the optically generated illuminated pn junction. **(10 Marks)**

Module-3

5 a. Derive the Ebers-Moll equations for the thermal currents in a transistor and represent the same. **(14 Marks)**

b. When the base narrowing effect occur in a transistor? **(06 Marks)**

OR

6 a. Illustrate the hole and electron flow in a pnp transistor with proper biasing. **(10 Marks)**

b. Show the switching effects in a common emitter transistor circuit. **(10 Marks)**

Module-4

7 a. Show the electric field direction, charge flow and induced charge region in a MOS capacitor with P-type substrate and n-type substrate when a moderate positive gate bias is applied. **(08 Marks)**

b. Represent the energy-band diagram through a MOS capacitor structure with P-type as a semiconductor and differential charge distribution for a differential change in gate voltage in the depletion and inversion mode. **(12 Marks)**

OR

8 a. Represent the energy band diagram of a MOS capacitor for the following cases :

(i) Negative gate bias in a MOS capacitor with ptype substrate.

(ii) Positive gate bias in a MOS capacitor with ntype as substrate.

(iii) Large negate gate bias in a MOS capacitor with n type as substrate. **(10 Marks)**

b. Show the channel formation in the MOS structure and I_D versus V_{DS} curve for the following cases :

(i) $V_{gs} > V_t$ and small V_{DS} value.

(ii) $V_{gs} > V_t$ and large V_{DS} value.

(iii) $V_{gs} > V_t$ and $V_{DS} = V_{DS}$ (sat). **(10 Marks)**

Module-5

9 a. Write the names of the different fabrication steps in a pn junction. **(08 Marks)**

b. Explain the evolution of ICs over the years. **(12 Marks)**

OR

10 a. Draw a neat sketch showing the ion implantation system in the fabrication of a pn junction and explain. **(10 Marks)**

b. Write the structure of a CMOS inverter and show the formation of p-channel and n-channel devices together. **(10 Marks)**

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CBCS SCHEME

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18EC34

Third Semester B.E. Degree Examination, July/August 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. Convert the following Boolean function into minterm canonical or maxterm canonical form:
(i) $y = \bar{\omega}x + y\bar{z}$ (ii) $(A + \bar{B} + C)(\bar{A} + D)$ **(06 Marks)**

b. Simplify the Boolean function and identify the prime and essential prime implicants:
(i) $f(a,b,c,d) = \sum m(1, 5, 7, 8, 9, 10, 11, 13, 15)$
(ii) $f(a,b,c,d) = \pi M(0, 2, 3, 8, 9, 10, 12, 14)$ **(06 Marks)**

c. Simplify the given Boolean function using Quine-Mc Cluskey method.
$f(a,b,c,d) = \sum m(0, 1, 2, 3, 6, 7, 8, 9, 14, 15)$ **(08 Marks)**

OR

2 a. Design a combinational logic circuit that has three input variables and produces a logic 1 output when more than one input variables are logic 1. **(06 Marks)**

b. Simplify the following Boolean function using K-map.
(i) $f(w,x,y,z) = \pi(2, 3, 8, 9, 10, 11, 12, 13, 14, 15)$
(ii) $f(w,x,y,z) = \sum m(6, 7, 9, 10, 13) + \sum d(1, 4, 5, 11, 15)$ **(06 Marks)**

c. Simplify the given Boolean function using Quine-Mc Clusky method.
$f(w,x,y,z) = \sum m(1,3,13,15) + \sum d(8,9,10,11)$ **(08 Marks)**

Module-2

3 a. Design a combinational circuit using 3 : 8 decoder (IC – 74138) that generates a logic 1 output when majority of 4 inputs are true. **(06 Marks)**

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

c. Implement a full adder using PAL. **(06 Marks)**

OR

4 a. Implement $f(w,x,y,z) = \sum m(0,1,2,4,5,7,8,9,12,13)$ using 8 : 1 MUX with w,x,y as select lines. **(06 Marks)**

b. Design 2-bit magnitude comparator. **(08 Marks)**

c. Explain the Basic Architecture of a Xilinx XCR3064XL CPLD. **(06 Marks)**

Module-3

5 a. Explain the working of Master Slave JK Flip-Flop with function table and timing diagram. **(08 Marks)**

b. Differentiate between Flip Flops and Latches. **(04 Marks)**

c. Design an universal shift Register using positive edge triggered DFF having the behavior as specified.

Mode	Operation
00	Hold
01	Shift right
10	Shift left
11	Parallel load

(08 Marks)

OR

6 a. Explain positive edge Triggered D Flip Flop with the help of circuit diagram and waveform. **(08 Marks)**

b. Obtain the characteristic equation for the following Flip Flop (i) J.K. (ii) S.R. **(06 Marks)**

c. Design a mod-8 asynchronous upcounter using negative edge triggered JK FF. **(06 Marks)**

Module-4

7 a. Design a synchronous mod-6 counter using clocked JK Flip Flop for the sequence 0 – 2 – 3 – 6 – 5 – 1 **(08 Marks)**

b. Distinguish between Moore and Melay model with necessary block diagram. **(06 Marks)**

c. Analyze the following synchronous circuit. (Refer Fig. Q7 (c))

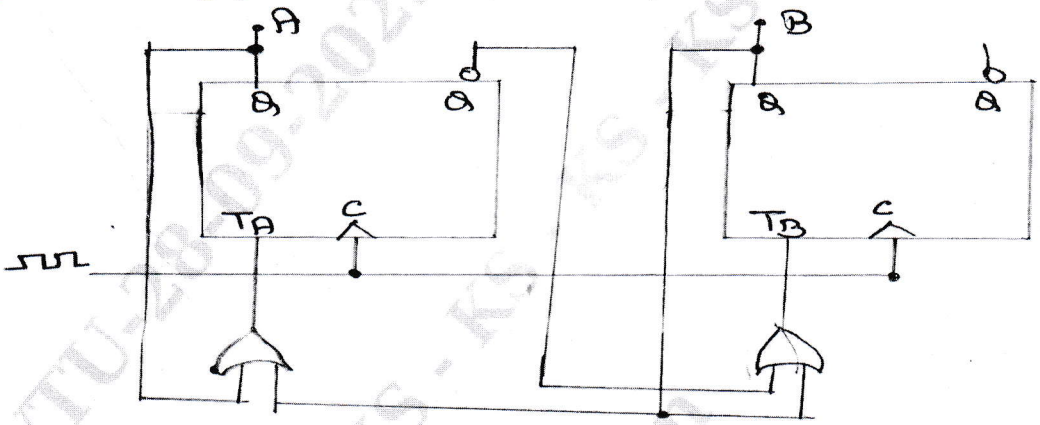

Fig. Q7 (c) **(06 Marks)**

OR

8 a. Design a synchronous mod-6 counter using clocked T-Flip Flop for the sequence, 0 – 2 – 3 – 6 – 5 – 1. **(06 Marks)**

b. Draw the state diagram, for the sequential circuit shown. (Refer Fig. Q8 (b))

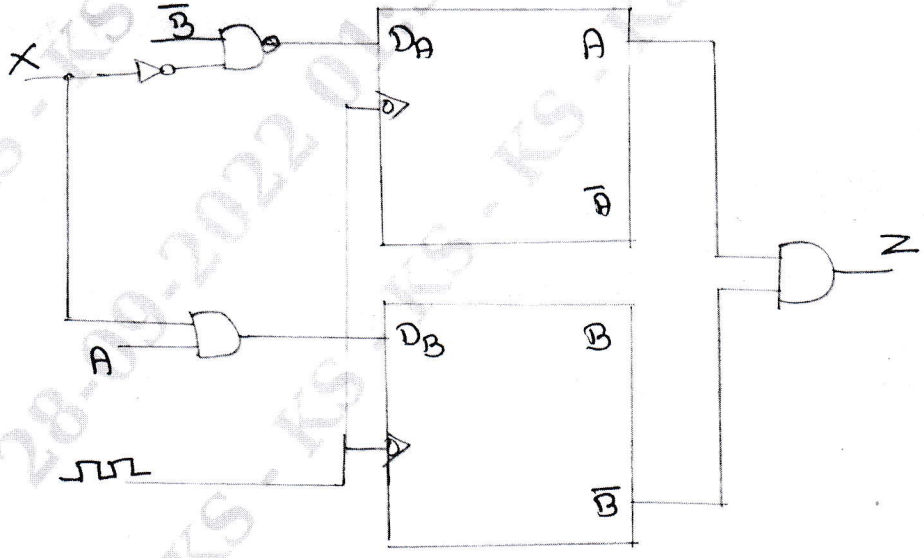

Fig. Q8 (b) **(06 Marks)**

c. Analyze the given synchronous sequential circuit. (Refer Fig. Q8 (c))

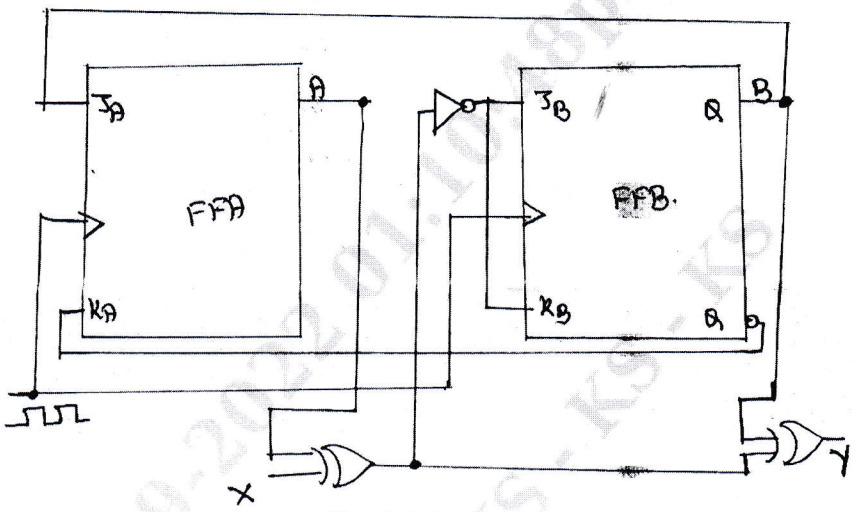

Fig. Q8 (c) **(08 Marks)**

Module-5

9 a. Design a Mealy type sequence detector to detect a serial input sequence of 101. **(08 Marks)**

b. List the guidelines for construction of state graphs. **(06 Marks)**

c. With the help of neat block diagram, explain serial adder with accumulator. **(06 Marks)**

OR

10 a. Design a Moore type sequence detector to detect a serial input sequence of 101. **(08 Marks)**

b. Construct Moore and Mealy state diagram, that will detect input sequence 10110, when input pattern is detected, z is asserted high. Give state diagrams for each state. **(06 Marks)**

c. With the help of neat block diagram, explain parallel binary divider. **(06 Marks)**

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CBCS SCHEME

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

18EC35

Third Semester B.E. Degree Examination, July/August 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. With a neat diagram, describe the functional units of a computer. **(08 Marks)**
b. Illustrate single bus structure of a computer. **(06 Marks)**
c. Explain Little-endian and Big-endian byte address assignment. **(06 Marks)**

OR

2 a. Explain the following with an example:
i) Three-address instruction
ii) Two-address instruction
iii) One-address instruction. **(09 Marks)**
b. List the functions of system software in computer. **(06 Marks)**
c. Discuss IEEE standard for single precision and double precision floating point numbers with standard notations. **(05 Marks)**

Module-2

3 a. Define addressing mode. Discuss the following addressing modes with example:
i) Register ii) Direct iii) Indirect iv) Index. **(10 Marks)**
b. Explain various assembler directives used in assembly language program. **(06 Marks)**
c. List the operations performed by call and return instructions. **(04 Marks)**

OR

4 a. With example illustrate logical and arithmetic shift and rotate instructions. **(10 Marks)**
b. Explain stack operation with example. **(10 Marks)**

Module-3

5 a. Illustrate interrupt priority schemes, with neat diagram. **(08 Marks)**
b. Describe the bus arbitration schemes, with neat diagram. **(12 Marks)**

OR

6 a. Explain use of DMA controllers in a computer system, with neat diagram. **(08 Marks)**
b. What are interrupts? Explain various ways of enabling and disabling interrupts. **(08 Marks)**
c. Write a explanatory note on interrupt hardware. **(04 Marks)**

Module-4

7 a. Illustrate internal organization of a 2M × 8 dynamic memory chip. **(08 Marks)**
b. What is mapping functions? Explain direct mapping scheme, with neat diagram. **(06 Marks)**
c. With neat diagram, explain virtual memory organization. **(06 Marks)**

OR

8 a. Explain principle of working of magnetic disk, with neat diagram. **(06 Marks)**
b. Discuss A single transistor dynamic memory cell. **(06 Marks)**
c. Explain different types of non-volatile memory concepts. **(08 Marks)**

Module-5

9 a. Illustrate multiple Bus organization concept, with neat diagram. **(10 Marks)**
b. Describe basic organization of a micro programmed control unit. Give an example of microinstructions. **(10 Marks)**

OR

10 a. Develop the complete control sequence for the execution of instruction Add (R3), R1. **(06 Marks)**
b. Discuss Hardwired control unit organization with relevant diagram. **(08 Marks)**
c. Illustrate the connection and control signals for register MDR with neat diagram. **(06 Marks)**

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CBCS SCHEME

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18EC36

Third Semester B.E. Degree Examination, July/August 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. List and briefly explain the different types of power electronic convertors. **(10 Marks)**

b. Explain the different turn-on methods of thyristor. **(10 Marks)**

OR

2 a. With neat circuit diagram and waveforms, explain class-A and class-B commutation methods of a thyristor. **(10 Marks)**

b. With neat diagram, explain static anode-cathode characteristics of SCR. Define latching current and holding current. **(10 Marks)**

Module-2

3 a. With the help of neat circuit diagram and waveforms describe the operation of a 1ϕ FWCR for B-2 connection for R-load. Derive expressions for rms and average output voltages and for rms and average output currents. **(10 Marks)**

b. A single phase half-wave converter is operated from a 120V, 60Hz supply. The load is resistive with R = 10Ω. If the average output voltage is 75% of maximum possible average output voltage, determine: i) Firing angle ii) rms and average output currents iii) average and rms SCR currents. **(06 Marks)**

c. Explain different control techniques of phase control converters. **(04 Marks)**

OR

4 a. What is dc-dc converter? What are its applications? Explain the classification of chopper. **(06 Marks)**

b. Explain the operation of step-up chopper with neat circuit diagram and waveforms. **(08 Marks)**

c. For a chopper shown in Fig.Q.4(c), dc source voltage = 230V, load resistance = 10. Consider voltage drop of 2V across chopper when it is on. For a duty cycle of 0.4, calculate: i) Average and rms value of output voltage ii) Chopper efficiency. **(06 Marks)**

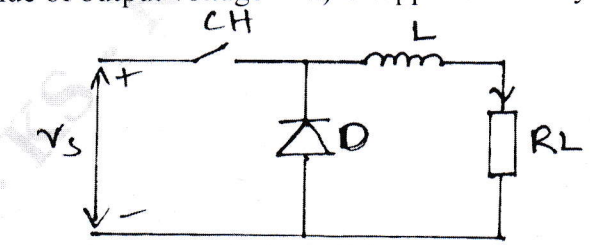

Fig.Q.4(c)

Module-3

5 a. Explain the operation of single-phase half bridge voltage source inverter with resistive load. Draw associated circuit diagram and waveforms. Derive the expressions for RMS output voltage and instantaneous output voltage. **(10 Marks)**

b. With the help of circuit diagram and waveforms explain the operation of flyback converter in discontinuous mode. Also list the advantages and disadvantages. **(10 Marks)**

OR

6 a. Explain different types of errors, and how to minimize them. **(06 Marks)**

b. Explain with a diagram how a PMMC can be used as an ammeter. How can a basic ammeter be converted into a multirange ammeter? **(08 Marks)**

c. Calculate the value of multiplier resistance for the multiple range dc voltmeter circuit shown in Fig.Q.6(c). **(06 Marks)**

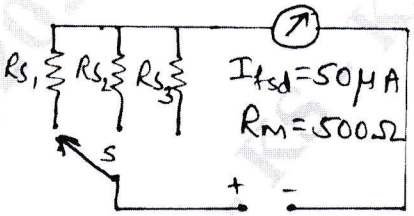

Fig.Q.6(c)

Module-4

7 a. Explain with the help of diagram and equations, the working principle of dual slope type DVM. **(10 Marks)**

b. With neat diagram, explain the operation of SAR type DVM. **(10 Marks)**

OR

8 a. Explain with the help of block diagram the operation of a function generator. **(06 Marks)**

b. Explain Wien's bridge with diagram. And derive the two balance conditions for a Wien bridge. **(06 Marks)**

c. If the sensitivity of the galvanometer in the circuit of Fig.Q.8(c) is 10mm/μA, and its internal resistance = 150Ω. Determine its deflection. **(08 Marks)**

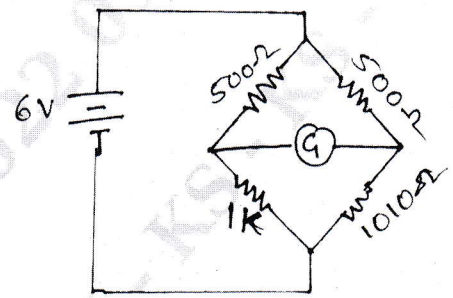

Fig.Q.8(c)

Module-5

9 a. State the various parameters and advantages of electrical transducer. **(06 Marks)**

b. Explain the working principle of thermistor. **(06 Marks)**

c. Explain with diagrams the structure and operation of a PLC. **(08 Marks)**

OR

10 a. Explain in brief bonded strain gauge. **(10 Marks)**

b. Explain how the strain gauge bridge circuit is used as analog weight scale. **(10 Marks)**

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