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VTU Question Papers

BE - ME

III to VIII Semester

Jul/Aug -2022

2018 Scheme

Maharaja Institute of Technology Thandavapura

Just of NH-766,Mysore-ooty highway,Thandavapura(Vill & Post),Nanjangud Taluk,Mysore District-571302.

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CBCS SCHEME

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18MAT31

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 $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + ... = \frac{\pi}{4}$. **(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 $y(0) = 0 = y$ **(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 $5xy^1 + y^2 - 2 = 0$, 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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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))

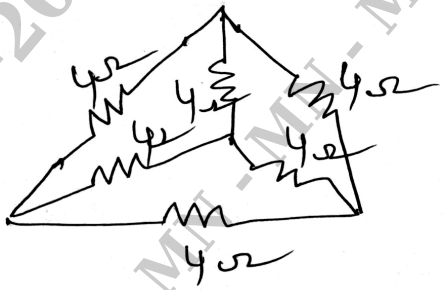

Fig Q1(c) **(05 Marks)**

OR

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

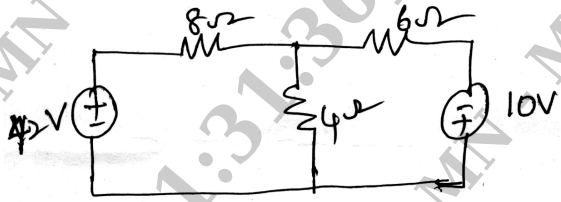

Fig Q2(a) **(10 Marks)**

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).

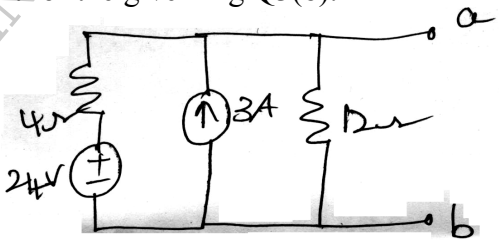

Fig Q3(b) **(10 Marks)**

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).

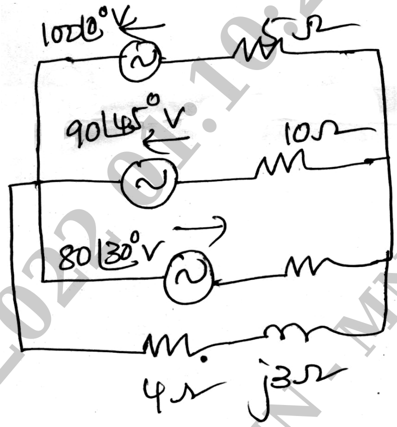

Fig Q4(a) **(10 Marks)**

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))

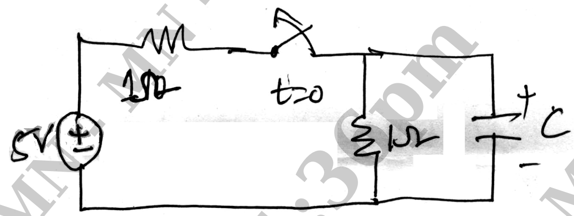

Fig Q5(b) **(10 Marks)**

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))

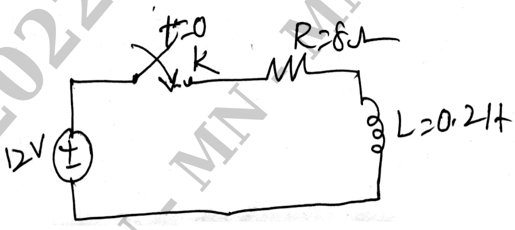

Fig Q6(a) **(10 Marks)**

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 $t = 0^+$.

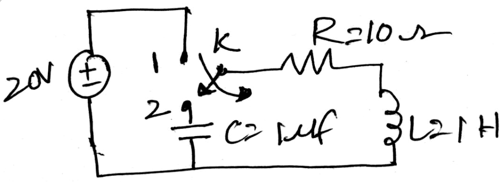

Fig Q6(b) **(10 Marks)**

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).

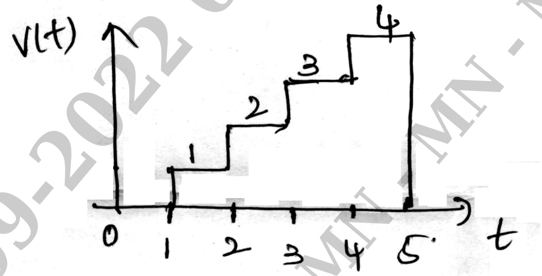

Fig Q8(a) **(10 Marks)**

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

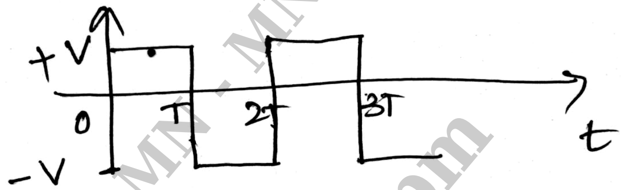

Fig Q8(b) **(10 Marks)**

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.

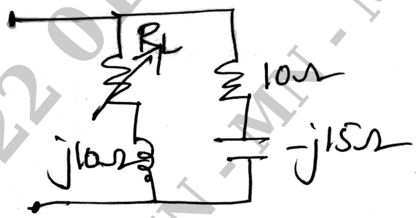

Fig Q9(b) **(10 Marks)**

OR

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

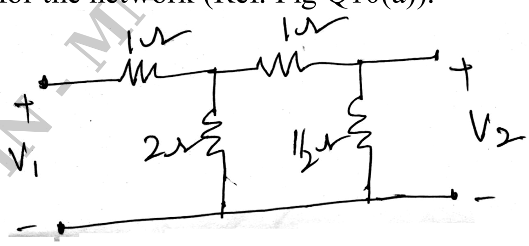

Fig Q10(a) **(10 Marks)**

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

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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))

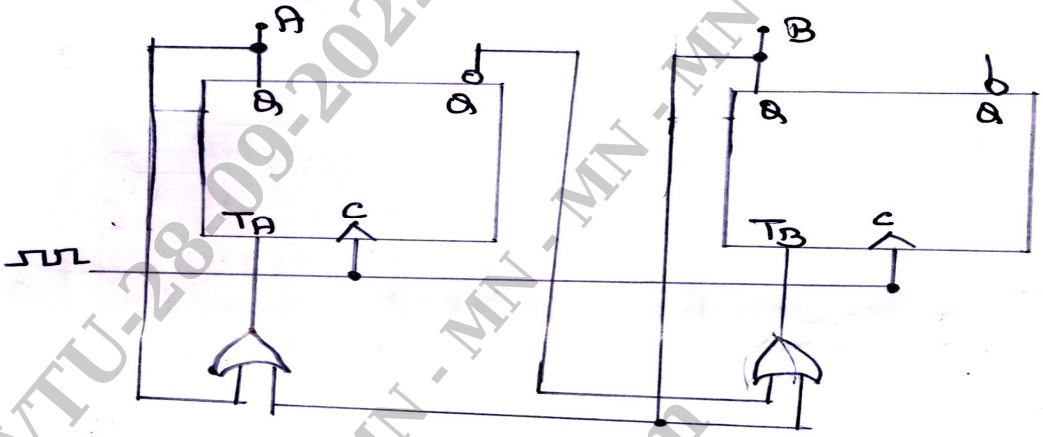

Fig. Q7 (c) **(06 Marks)**

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))

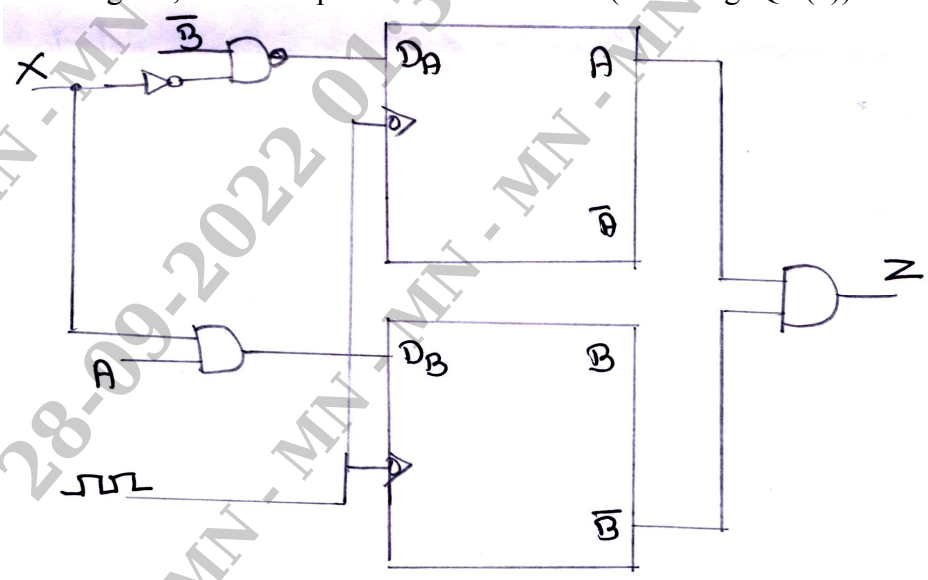

Fig. Q8 (b) **(06 Marks)**

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

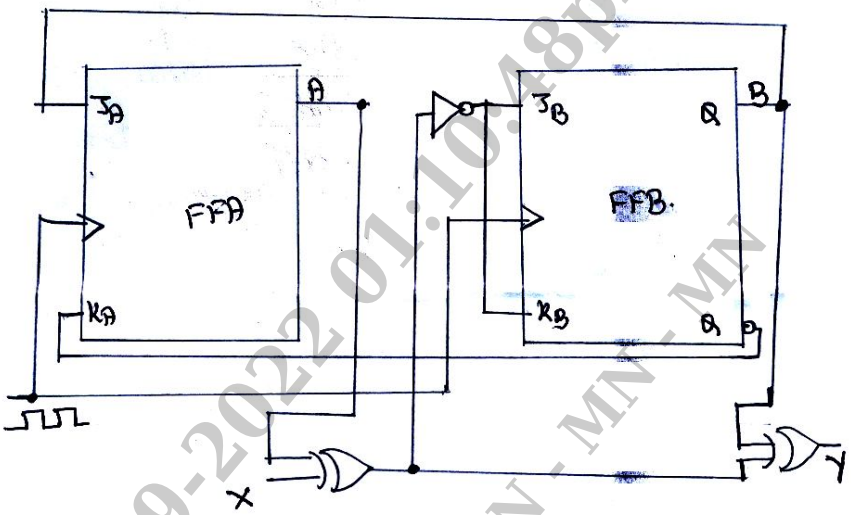

Fig. Q8 (c) **(08 Marks)**

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

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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)**

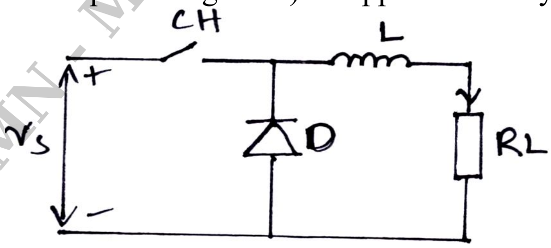

Fig.Q.4(c)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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)**

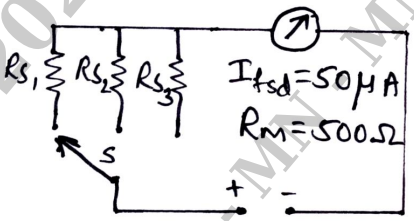

Fig.Q.6(c)

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)**

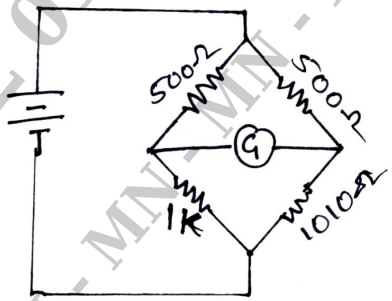

Fig.Q.8(c)

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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CBCS SCHEME

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18MAT41

Fourth Semester B.E. Degree Examination, July/August 2022

Complex Analysis, Probability and Statistical Methods

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Derive Cauchy-Riemann equation in Polar form. **(06 Marks)**

b. Find the analytic function f(z) whose real part is
$x \sin x \cosh y - y \cos x \sinh y$ **(07 Marks)**

c. If f(z) is analytic show that
$$\left[\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right] |f(z)|^2 = 4|f'(z)|^2$$ **(07 Marks)**

OR

2 a. Find the analytic function f(z) given that the sum of its real and imaginary part is
$x^3 - y^3 + 3xy(x-y)$ **(06 Marks)**

b. Find the analytic function $f(z) = u + iv$ if
$v = r^2 \cos 2\theta - r\cos\theta + 2$ **(07 Marks)**

c. If f(z) is analytic function then show that
$$\left\{\frac{\partial}{\partial x}|f(z)|\right\}^2 + \left\{\frac{\partial}{\partial y}|f(z)|\right\}^2 = |f'(z)|^2$$ **(07 Marks)**

Module-2

3 a. State and prove Cauchy's Integral formula. **(06 Marks)**

b. Evaluate $\int_0^{2+i} \bar{z}^2 dz$ along (i) the line $y = \frac{x}{2}$ (ii) The real axis to 2 and then vertically to 2 + i. **(07 Marks)**

c. Find the bilinear transformation which maps the points 1, i, –1 onto the points i, 0, –i respectively. **(07 Marks)**

OR

4 a. Discuss the transformation $w = e^z$, with respect to straight lines parallel to x and y axis. **(06 Marks)**

b. Using Cauchy's integral formula evaluate
$$\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz, \text{ where } c : |z| = 3$$ **(07 Marks)**

c. Find the bilinear transformation which maps the points 0, 1, ∞ on to the points –5, –1, 3 respectively. **(07 Marks)**

Module-3

5 a. A random variable X has the following probability function for various values of X.

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Find i) k ii) $P(X < 6)$ iii) $P(3 < X \le 6)$ **(06 Marks)**

b. Out of 800 families with 5 children each, how many families would you expect to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) atmost 2 girls, assuming equal probabilities for boys and girls. **(07 Marks)**

c. The length in time (minutes) that a certain lady speaks on a telephone is a random variable with probability density function

$$f(x) = \begin{cases} Ae^{-x/5} & \text{for } x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

Find the value of the constant A. What is the probability that she will speak over the phone for (i) More than 10 minutes (ii) Less than 5 minutes (iii) Between 5 and 10 minutes. **(07 Marks)**

OR

6 a. Find the constant C such that the function

$$f(x) = \begin{cases} Cx^2, & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$$ is a probability density function. Also compute $P(1 < x < 2)$, $P(x \le 1)$ and $P(x > 1)$ **(06 Marks)**

b. 2% fuses manufactured by a firm are found to be defective. Find the probability that the box containing 200 fuses contains
(i) No defective fuses (ii) 3 or more defective fuses (iii) At least one defective fuse. **(07 Marks)**

c. If x is a normal variate with mean 30 and standard deviation 5 find the probabilities that (i) $26 \le x \le 40$ (ii) $x \ge 45$ (iii) $|x - 30| > 5$
Given that $\phi(1) = 0.3413$, $\phi(0.8) = 0.2881$, $\phi(2) = 0.4772$, $\phi(3) = 0.4987$ **(07 Marks)**

Module-4

7 a. The following table gives the ages (in years) of 10 married couples. Calculate Karl Pearson's coefficient of correlation between their ages:

Age of husband (x)	23	27	28	29	30	31	33	35	36	39
Age of wife (y)	18	22	23	24	25	26	28	29	30	32

(06 Marks)

b. In a partially destroyed laboratory record of correlation data only the following results are available:
Variance of x is 9 and regression lines are $8x - 10y + 66 = 0$, $40x - 18y = 214$. Find
(i) Mean value of x and y
(ii) Standard deviation of y
(iii) Coefficient of correlation between x and y. **(07 Marks)**

c. Fit a parabola of the form $y = ax^2 + bx + c$ for the data

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(07 Marks)

OR

8 a. Obtain the lines of regression and hence find the coefficient of correlation of the data:

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

(06 Marks)

b. Show that if θ is the angle between the lines of regression

$$\tan\theta = \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}\left(\frac{1 - r^2}{r}\right)$$ **(07 Marks)**

c. Fit a straight line y = a + bx to the data

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

(07 Marks)

Module-5

9 a. The joint probability distribution of the random variables X and Y is given below.

X \ Y	-4	2	7
1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
5	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

Find (i) E[X] and E[Y] (ii) E[XY] (iii) cov(X, Y) iv) ρ(X, Y).
Also, show that X and Y are not independent. **(06 Marks)**

b. A manufacturer claimed that atleast 95% of the equipment which he supplied to a factory confirmed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 of them were faulty. Test his claim at a significance level of 1% and 5% ($z_{0.05} = 1.96$, $z_{0.01} = 2.58$). **(07 Marks)**

c. A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure 5, 2, 8, –1, 3, 0, 6, –2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure ($t_{0.05}$ for 11 d.f. is 2.201) **(07 Marks)**

OR

10 a. Define the terms :
(i) Null hypothesis (ii) Type-I and Type – II errors (iii) Significance level **(06 Marks)**

b. In an experiment of pea breeding the following frequencies of seeds were obtained:

Round Yellow	Wrinkled Yellow	Round Green	Wrinkled Green	Total
315	101	108	32	556

Theory predicts that the frequencies should be in proportions 9:3:3:1
Is the experiment in agreement with theory ($\chi^2_{0.5}$ for 3 d.f is 7.815) **(07 Marks)**

c. The joint probability distribution of two discrete random variable X and Y is given by f(x, y) = k(2x + y) where x and y are integers such that $0 \le x \le 2$, $0 \le y \le 3$. Find k and the marginal probability distribution of X and Y. Show that the random variables X and Y are dependent. Also, find $P(X \ge 1, Y \le 2)$. **(07 Marks)**

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18EC42

Fourth Semester B.E. Degree Examination, July/August 2022
Analog Circuits

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 working of voltage dividing bias circuit using BJT. **(08 Marks)**

b. Design MOSFET drain to gate feedback circuit to establish I_D = 0.5 mA and V_{DD} = 5V. MOSFET parameters are : V_t = 1 V, $K'_n(W/L) = 1\ mA/V^2$ and λ = 0. Use Standard resistor values and actual values obtained for I_D and V_D. **(06 Marks)**

c. Derive an expression for voltage gain A_V of small signal CE BJT amplifier. **(06 Marks)**

OR

2 a. Explain with neat circuit diagram the MOSFET drain to gate feedback resistor biasing. **(06 Marks)**

b. Design a voltage divider bias network using a supply of 24V, β = 110 and I_{CQ} = 4 mA, V_{CEQ}= 8V. Choose $V_E = V_{CC} / 8$. **(08 Marks)**

c. Explain with neat circuit diagram MOSFET circuit using fixing V_G. **(06 Marks)**

Module-2

3 a. Derive the expression for characterizing parameters of CS MOSFET amplifier without source resistor using hybrid-π equivalent circuit. **(06 Marks)**

b. A phase shift oscillator is to be designed with FET having g_m = 5000 μs, r_d = 40 kΩ while the resistance in the feedback circuit is 9.7 kΩ. Select the proper value of C and R_D to have the frequency of oscillations as 5 kHz. **(08 Marks)**

c. Write a note on three basic configurations of MOSFET amplifier. **(06 Marks)**

OR

4 a. State Barkhausen criteria. **(04 Marks)**

b. A Quartz crystal has constants L = 50 mH, C_1 = 0.02 pF, R = 500Ω and C_2 = 12 pF. Find the values of series and parallel resonant frequencies. Also if the external capacitance across the crystal changes from 5 pF to 6 pF, find the change in frequency of oscillations. **(08 Marks)**

c. Draw and explain the frequency response characteristics of CS MOSFET amplifier. **(08 Marks)**

Module-3

5 a. Briefly explain the four basic feedback topologies with necessary block diagram. **(10 Marks)**

b. Show that the maximum efficiency of series fed, directly coupled class A power amplifier is 25%. **(06 Marks)**

c. An amplifier without negative feedback has a voltage gain of 400 with a distortion of 10%. Determine the amplifier voltage gain and distortion, when a negative feedback is applied with feedback ratio of 0.01. **(04 Marks)**

OR

6 a. With neat circuit diagram, explain the operation of a class B pushpull amplifier with relevant waveforms. Show that the maximum conversion efficiency of class B pushpull amplifier is 78.5%. **(10 Marks)**

b. For a class C tuned amplifier with load resistance of 10 kΩ and V_{CC} = 30V. Calculate
(i) Output power if the output voltage is 30 V_{pp}.
(ii) DC input power if current drain is 0.5 mA.
(iii) Efficiency. **(04 Marks)**

c. Derive the expression for input resistance for a voltage shunt feedback amplifier. **(06 Marks)**

Module-4

7 a. State the ideal characteristics of op-Amp. **(08 Marks)**

b. For a Schmitt trigger shown in the Fig.Q7(b) calculate threshold voltage levels and hysteresis. Assume V_{sat} = 0.9 V_c.

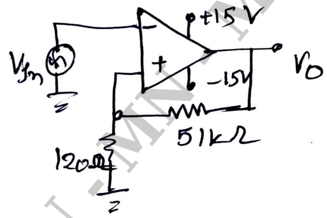

Fig.Q7(b) **(04 Marks)**

c. Draw a practical inverting amplifier and derive the expression for closed loop voltage gain, input resistance and output resistance. **(08 Marks)**

OR

8 a. Draw the circuit of 3 op-Amp instrumentation amplifier and derive expression for its output voltage. **(08 Marks)**

b. Explain the working of zero crossing detector. **(06 Marks)**

c. For a non-inverting amplifier, the values of R_1 and R_f are 1 kΩ and 10 kΩ respectively. The various op-Amp parameters are, open loop gain = 2×10^5, Input resistance = 2MΩ, Output resistance = 75Ω, Single break frequency = 5 Hz , Supply voltages = ±12V , Calculate the closed loop gain, input resistance, output resistance with feedback and bandwidth with feedback. **(06 Marks)**

Module-5

9 a. Draw and explain the working of precision full wave rectifier. **(08 Marks)**

b. Design a low pass filter using op-Amp at a cutoff frequency of 1 kHz with pass gain of 2. **(06 Marks)**

c. Explain the working of pulse width modulator using IC555 with waveforms. **(06 Marks)**

OR

10 a. Explain the functional block diagram of IC555. **(08 Marks)**

b. Design a monostable 555 timer circuit to produce an output pulse of 10 sec wide. Draw the circuit diagram. **(04 Marks)**

c. Explain with neat circuit diagram the operation of R-2R digital to analog converter. **(08 Marks)**

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CBCS SCHEME

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18EC43

Fourth Semester B.E. Degree Examination, July/August 2022
Control Systems

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. What is Control System? Distinguish between open loop and closed loop system. Give one example for each. **(08 Marks)**

b. Write the differential equations governing the mechanical system shown in Fig.Q.1(b). Draw the force-voltage and force-current electrical analogous circuits. **(12 Marks)**

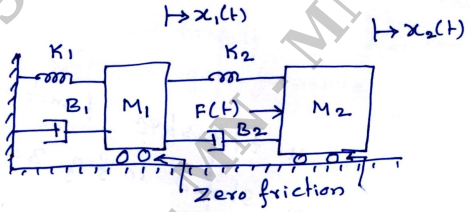

Fig.Q.1(b)

OR

2 a. Write the differential equations governing the mechanical rotational system shown in Fig.Q.2(a). Obtain the transfer function of the system. **(10 Marks)**

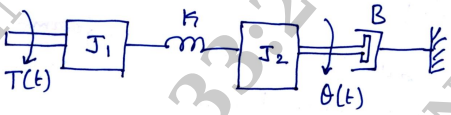

Fig.Q.2(a)

b. Write the differential equations governing the mechanical rotational system shown in Fig.Q.2(b). Draw the torque-voltage analogous circuit. **(10 Marks)**

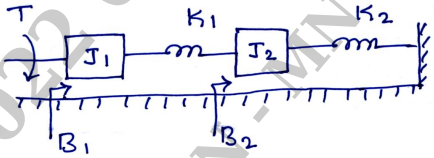

Fig.Q.2(b)

Module-2

3 a. Determine the overall transfer function $\frac{C(S)}{R(S)}$ for the system shown in Fig.Q.3(a) using block diagram reduction technique. **(10 Marks)**

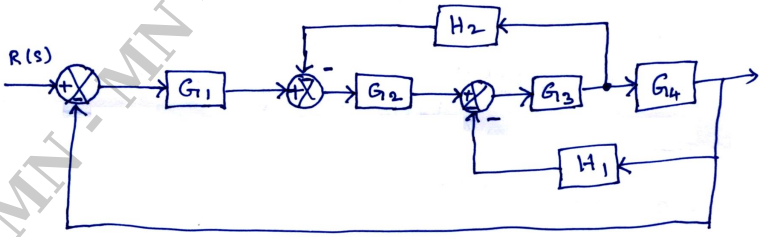

Fig.Q.3(a)

b. Find the overall T.F by Mason's gain formula for the SFG given in the Fig.Q.3(b). **(10 Marks)**

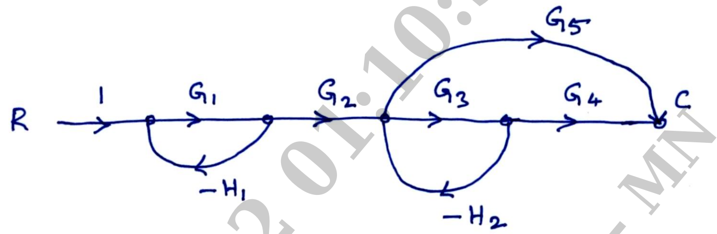

Fig.Q.3(b)

OR

4 a. Draw the SFG and obtain the FF transfer function for a system which is described by the set of following algebraic equations.

$y_2 = a_{12}y_1 + a_{32}y_3$
$y_3 = a_{23}y_2 + a_{43}y_4$
$y_4 = a_{24}y_2 + a_{34}y_3 + a_{44}y_4$
$y_5 = a_{25}y_2 + a_{45}y_4$ **(10 Marks)**

b. Find out the transfer function shown in Fig.Q.4(b) using Mason's gain formula. **(10 Marks)**

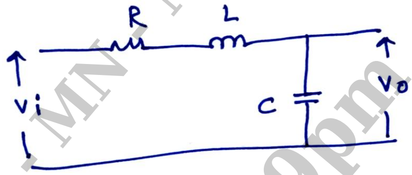

Fig.Q.4(b)

Module-3

5 a. Derive the expression of response of first order system for unit step input. **(10 Marks)**

b. With neat graph explain the time domain specifications of second order system. **(10 Marks)**

OR

6 a. Obtain the response of unity feed back system whose open loop transfer function $G(S) = \frac{4}{S(S+5)}$ and when input is unit step. **(10 Marks)**

b. A unity feed back system with $G(S) = \frac{100}{S^2(S+1)(S+2)}$

i) What is the type of system?
ii) Find static error coefficients.
iii) Find steady state error if the input is $r(t) = 2t^2 + 5t + 1$. **(10 Marks)**

Module-4

7 a. Derive the expression for condition of stability of control system. **(05 Marks)**

b. Explain Routh-Hurwitz criterion for stability of the system and what are its limitations. **(05 Marks)**

c. Find the range of K so that the system with characteristic equation as: $s^4 + 25s^3 + 15s^2 + 20s + k = 0$ is stable. Also find frequency of oscillation at marginal value of K. **(10 Marks)**

OR

8 a. Sketch the root Locus plot for all values of K ranging from o to ∞ for a negative feed back control system characterized by $GH(S)=\frac{K(S+6)}{S(S+1)(S+2)}$. **(10 Marks)**

b. Plot the Bode diagram for open loop transfer function

$G(S)=\frac{10}{S(1+0.4s)(1+0.1s)}$ and obtain the gain and phase cross over frequencies. **(10 Marks)**

Module-5

9 a. Using Nyquist stability criterion, investigate the stability of a closed loop system whose OLTF is given by

$$G(S)H(S)=\frac{K}{(S+1)(S+2)}.$$ **(10 Marks)**

b. Distinguish between classical method and state space approach. **(10 Marks)**

OR

10 a. A negative feed back control system is characterized by an open loop transfer function.

$$GH(S)=\frac{5}{S(S+1)}$$

Investigate the closed loop stability of the system using Nyquist stability criterion. **(10 Marks)**

b. Write a state model for differential equation

$$4\frac{d^3}{dt^3}y+8\frac{d^2}{dt^2}y+24\frac{dy}{dt}+4y=32\,U(t)$$

Using phase variable canonical form. **(10 Marks)**

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CBCS SCHEME

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18EC44

Fourth Semester B.E. Degree Examination, July/August 2022
Engineering Statistics and Linear Algebra

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define an uniform random variable. Obtain the characteristic function of an uniform random variable and using the characteristic function derive its mean and variance. **(08 Marks)**

b. If the probability density function of a random variable is given by

$$f_X(x) = \begin{cases} C\exp(-x/4), & 0 \le x < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find the value that C must have and evaluate $F_X(0.5)$. **(06 Marks)**

c. The density function of a random variable is given as

$f_X(x) = a\, e^{-bx} \quad x \ge 0$

Find the characteristic function and the first two moments. **(06 Marks)**

OR

2 a. Define a Poisson random variable. Obtain the characteristic function of a Poisson random variable and hence find mean and variance using the characteristic function. **(08 Marks)**

b. Suppose 'X' is a general discrete random variable with following probability distribution. Calculate mean and variance for X.

X	0	1	3	5	7
P(X)	0.05	0.2	0.6	0.1	0.05

(06 Marks)

c. The number of defects in a thin copper wire follows Poisson distribution with mean of 2.3 defects per millimeter. Determine the probability of exactly two defects per millimeter of wire. **(06 Marks)**

Module-2

3 a. Define and explain Central Limit theorem and show that the sum of the two independent Gaussian random variables is also Gaussian. **(08 Marks)**

b. Let 'X' and 'Y' be exponentially distributed random variable with

$$f_X(x) = \begin{cases} \lambda\, e^{-\lambda x} & x \ge 0 \\ 0 & x < 0 \end{cases}$$

Then obtain the characteristic function and Pdf of W = X + Y. **(06 Marks)**

c. Determine a constant b such that the given function is a valid joint density function.

$$f_{XY}(x,y) = \begin{cases} b(x^2 + 4y^2) & 0 \le |x| < 1 \text{ and } 0 \le y < 2 \\ 0 & \text{elsewhere} \end{cases}$$

(06 Marks)

OR

4 a. Explain briefly the following random variables :
(i) Chi-square Random Variable
(ii) Rayleigh Random Variable. **(04 Marks)**

b. The joint density function of two random variables X and Y is

$$f_{X,Y}(x,y)=\begin{cases}\dfrac{(x+y)^2}{40}, & -1<x<1 \text{ and } -3<y<3\\ 0, & \text{elsewhere}\end{cases}$$

Find (i) the variances of X and Y (ii) the correlation coefficient. **(08 Marks)**

c. Gaussian random variables X_1 and X_2 whose $\overline{X}_1=2$, $\sigma^2_{X_1}=9$, $\overline{X}_2=-1$, $\sigma^2_{X_2}=4$ and $C_{X_1X_2}=-3$ are transformed to new random variables Y_1 and Y_2 such that

$Y_1=-X_1+X_2$

$Y_2=-2X_1-3X_2$

Find (i) $\overline{X_1^2}$ (ii) $\overline{X_2^2}$ (iii) $\rho_{X_1X_2}$ (iv) $\sigma^2_{Y_1}$ (v) $\sigma^2_{Y_2}$ (vi) $C_{Y_1Y_2}$ (vii) $\rho_{Y_1Y_2}$ **(08 Marks)**

Module-3

5 a. With the help of an example, define Random process and discuss distribution and density functions of a random process. Mention the differences between Random variable and Random process. **(08 Marks)**

b. Define the Autocorrelation function of the random process X(t) and discuss its properties. **(06 Marks)**

c. A stationary ergodic random process has the autocorrelation function with periodic components as $R_{XX}(\tau)=25+\dfrac{4}{1+6\tau^2}$

Find the mean and variance of X(t). **(06 Marks)**

OR

6 a. The autocorrelation function of a wide sense stationary process.

$$R_X(\tau)=\begin{cases}1-\dfrac{|\tau|}{T}, & -T\le|\tau|\le T\\ 0, & \text{elsewhere}\end{cases}$$

Obtain the Power Spectral Density of the process. **(06 Marks)**

b. Show that the random process X(t) = A cos($w_c t + \theta$) is wide sense stationary. Here θ is uniformly distributed in the range $-\pi$ to π. **(08 Marks)**

c. X(t) and Y(t) are independent, jointly wide sense stationary random processes given by

$X(t) = A\cos(w_1t+\theta_1)$

$Y(t) = B\cos(w_2t+\theta_2)$

If $W(t) = X(t)\cdot Y(t)$ then find the Autocorrelation function $R_W(\tau)$. **(06 Marks)**

Module-4

7 a. Define vector subspaces and explain the four fundamental subspaces. **(06 Marks)**

b. Show that the vectors (1, 2, 1), (2, 1, 0), (1, –1, 2) form a basis of R^3. **(06 Marks)**

c. Apply Gram-Schmidt process to the vectors v_1 = (2, 2, 1), v_2 = (1, 3, 1), v_3 = (1, 2, 2) to obtain an orthonormal basis for $v_3(R)$ with the standard inner product. **(08 Marks)**

OR

8 a. Determine the null space of each of the following matrices:

(i) $A=\begin{bmatrix}2 & 0\\ -4 & 10\end{bmatrix}$ (ii) $\begin{bmatrix}1 & -7\\ -3 & 21\end{bmatrix}$ **(06 Marks)**

b. Determine whether the vectors (2, –2, 4), (3, –5, 4) and (0, 1, 1) are linearly dependent or independent. **(06 Marks)**

c. Find the QR-decomposition for the matrix

$$A = \begin{bmatrix} 2 & 1 & 3 \\ -1 & 0 & 7 \\ 0 & -1 & -1 \end{bmatrix}$$

and write the result in the form of $A = QR$. **(08 Marks)**

Module-5

9 a. If $A = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$

find eigen values and corresponding eigen vectors for matrix A. **(08 Marks)**

b. Diagonalize the following matrix:

$$A = \begin{bmatrix} 1 & 3 & 3 \\ -3 & -5 & -3 \\ 3 & 3 & 1 \end{bmatrix}$$

Find an invertible matrix P and a diagonal matrix D such that $A = PDP^{-1}$. **(08 Marks)**

c. What is the positive definite matrix? Mention the methods of testing positive definiteness. **(04 Marks)**

OR

10 a. Factorize the matrix A into $A = U \Sigma V^T$ using SVD.

$$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ -1 & 1 \end{bmatrix}$$ **(08 Marks)**

b. If $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ show that A is positive definite matrix. **(04 Marks)**

c. Find a matrix P, which transforms the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to diagonal form. **(08 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | **18EC45**

Fourth Semester B.E. Degree Examination, July/August 2022
Signals and Systems

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Differentiate between Energy and Power signals. Identify whether u(t) is energy or power signals. Compute its energy / power. **(08 Marks)**

b. Given the signals x(t) & y(t) in the Fig. Q1(b), sketch
i) x(t - 2) + y(1 - t) ii) x(t) – y(t + 2). **(08 Marks)**

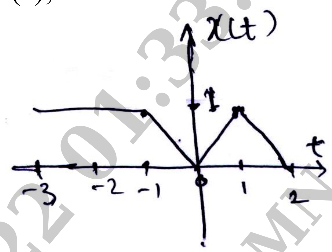
Fig. Q1(b)

c. Sketch the signal Z(t) = r(t + 2) – r(t + 1) – 2u(t) + u(t – 1). **(04 Marks)**

OR

2 a. For the signal shown in Fig. Q2(a), sketch its Even and Odd components. **(06 Marks)**

Fig. Q2(a)



b. Identify whether the following signals are periodic of not? If Periodic what is the period of it? i) $x(t) = \cos\sqrt{2}\,t + \sin 2\pi t$ ii) $x(t) = \cos 8\pi t$ iii) $x(n) = \sin\frac{\pi}{6}n + \sin\frac{\pi}{3}n.$ **(08 Marks)**

c. Sketch the signals : i) u(t – 2) – 2u(t) + u(t + 2) ii) e^{-2t} {u(t) – u(t – 2)}. **(06 Marks)**

Module-2

3 a. Check whether the following system is linear, time variant , causal , static and stable.
Y[n] = 2x[1 – n] + 2. **(08 Marks)**

b. Compute the following convolutions :
i) $y(t) = x(t) * h(t)$, where x(t) = u(t + 2) and $h(t) = e^{-2t}u(t)$.
ii) $y(t) = x(t) * h(t)$, where $x(t) = e^{-1+1}$ and h(t) = u(t). **(12 Marks)**

OR

4 a. The system is described by the differential equation
$$\frac{dy(t)}{dt} = 2x(t) + \frac{d}{dt}x(t).$$
State whether this system is linear , time variant , causal and static. **(08 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

b. i) Evaluate $y(n) = x(n) * h(n)$, if $x(n) = \alpha^n u(n)$ $\alpha < 1$ & $h(n) = u(n)$.
   ii) Evaluate $y(t) = x(t) * h(t)$, if x(t) & h(t) are as shown in Fig. Q4(b(ii)). **(12 Marks)**

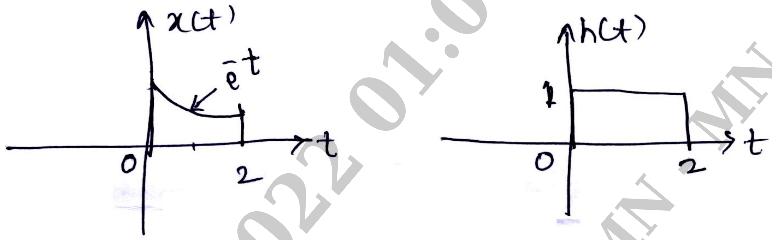
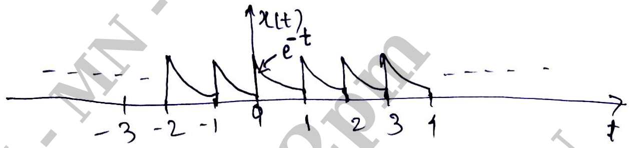


Fig. Q4(b(ii))

Module-3

5 a. Impulse responses of the various systems are described below. Identify whether these systems are memoryless, causal and stable.
   i) $h(n) = 2\delta(n)$ ii) $h(t) = e^{-2t} u(t + 2)$ iii) $h(t) = 2\{u(t) - u(t - 2)\}$. **(10 Marks)**
  b. Obtain the Fourier representations of the signals :
   i) $x(n) = \cos 2\pi n + \sin 4\pi n$ with $\Omega_0 = 2\pi$ ii) x(t) shown in Fig. Q5(b(ii)). **(10 Marks)**

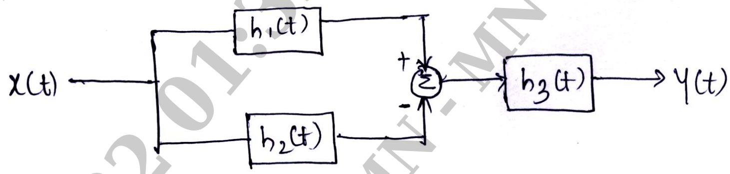
Fig. Q5(b(ii))



OR

6 a. Find the overall impulse response of the system shown in Fig. Q6(a). **(08 Marks)**

Fig. Q6(a)

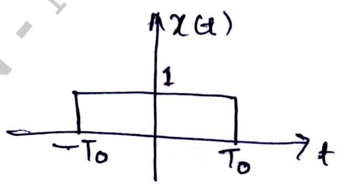


where $h_1(t) = u(t + 1)$, $h_2(t) = u(t - 2)$, $h_3(t) = e^{-3t} u(t)$.
  b. State and prove time shift property of Fourier Series. **(06 Marks)**
  c. Obtain DTFS coefficients of x(n) if $\Omega_0 = 3\pi$.
   i) $x(n) = \sin 6\pi n$ ii) $x(n) = \cos 3\pi n + \sin 9\pi n$. **(06 Marks)**

Module-4

7 a. State and prove Convolution property of DTFT. **(06 Marks)**
  b. Find F.T. of the signal shown in Fig. Q7(b). **(06 Marks)**

Fig. Q7(b)



  c. Find the time domain signal x(t) if its F.T. X(jw) given below :
   i) $X(jw) = \dfrac{jw}{(jw)^2 + 5jw + 6jw}$ ii) $X(jw) = \dfrac{1 - jw}{1 + w^2}$ **(08 Marks)**

OR

8 a. State and prove Parseval's theorem for Fourier transform. **(06 Marks)**

b. Using properties, find the DTFT of the signals.

i) $x(n) = (\frac{1}{2})^n u(n+2)$ ii) $x(n) = n \cdot a^n u(n)$. **(06 Marks)**

c. Obtain the signal x(t) , if its Fourier transform is

i) $X(jw) = \frac{1}{2 + j(w-3)}$ ii) $X(jw) = e^{-j3w} \frac{1}{jw+2}$ **(08 Marks)**

Module-5

9 a. Find the Z – transform of the signals.

i) $x(n) = (\frac{1}{2})^n u(n) - (\frac{3}{2})^n u(-n-1)$ ii) $x(n) = (-\frac{1}{3})^n u(n)$. **(07 Marks)**

b. State and prove differentiation in the Z – domain property of Z – transform. **(06 Marks)**

c. Use Partial fraction expansion to find the inverse Z – transform of

$$X(z) = \frac{z^2 - 3z}{z^2 - \frac{3}{2}z - 1} \quad |\frac{1}{2}| < |z| < |2|$$ **(07 Marks)**

OR

10 a. Use properties to find Z – transform of the following signals :

i) $x(n) = 3^n u(n-2)$ ii) $x(n) = n \sin\left(\frac{\pi}{2}n\right) u(n)$. **(08 Marks)**

b. Find the Inverse Z - transform.

i) $X(z) = \frac{1}{1 - \frac{1}{2} z^{-1}} + \frac{2}{1 - 2 z^{-1}} \quad |z| > |2|$.

ii) $X(z) = \frac{2 + z^{-1}}{1 - \frac{1}{2} z^{-1}} \quad |z| < |\frac{1}{2}|$, Use Power Series Expansion method. **(12 Marks)**

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CBCS SCHEME

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

18EC46

Fourth Semester B.E. Degree Examination, July/August 2022
Microcontrollers

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Write the block diagram of 8051 and explain its main features. **(08 Marks)**

b. What is an embedded system and write its characters. **(06 Marks)**

c. Write the starting address and ending address of internal RAM used in 8051 and how it is classified. **(06 Marks)**

OR

2 a. Show how 8K RAM and 8K EPROM can be interfaced to 8051 micro controller. Assume the EPROM starts from address 0000H. **(08 Marks)**

b. How many ports are present in 8051 and explain the different functions of each port. **(06 Marks)**

c. Compare microprocessor and micro controllers. **(06 Marks)**

Module-2

3 a. How the instruction set of 8051 is classified depending on the addressing mode and explain all of them with example. **(08 Marks)**

b. List the different SFR's present in 8051 and also write the address of them. **(04 Marks)**

c. Write an assembly level program to multiply the number present in external memory location 800AH and 8050H. Store the lower byte of result obtained in R0 and higher byte in R1. **(08 Marks)**

OR

4 a. Explain the different rotate instructions present in 8051 μC with an example. Also explain the working of SWAP instruction. **(08 Marks)**

b. Explain the working of the following instructions and also find the time required to execute each instruction :

i) MOVC A, @A+PC XTAL = 12 MHz used
ii) XCHD A, @R1 XTAL = 11.0592 MHz used
iii) ADDC A, R5 XTAL = 10MHz used
iv) DIV AB XTAL = 11.0592MHz. **(08 Marks)**

c. Write an assembly level program to set the bits 1, 4, 6, 7 of port 0 use bit level instructions to set the bits. **(04 Marks)**

Module-3

5 a. Explain the working of PUSH and POP instruction with necessary diagram. **(04 Marks)**

b. Write a program to toggle all bits of P1 every 200ms. Assume crystal frequency is 11.0592MHz. Show all the calculations. **(08 Marks)**

c. Write an assembly level program to count the number 1's and 0's present in the content of external memory location 8000H. Store the count of number 1's in reg. R0 and count of number of 0's in reg. R1. **(08 Marks)**

OR

6 a. What is the need of subroutine and explain the instructions associated with subroutine. **(08 Marks)**

b. Write an assembly level program to mutually exchange the 10 bytes of data stored in external memory location starting from 8000H and 8020H. **(06 Marks)**

c. Find the delay produced in the 8051 program.

```
Delay : MOVR3, # 200
Here :  NOD
        NOP
        DJN2 R3, here
        RET
```

Assume XTAL used 11.0592 MHz. **(06 Marks)**

Module-4

7 a. Explain all the bits of TMOD and TCON register. **(08 Marks)**

b. Assuming XTAL frequency as 11.0592MHz write a program to generate 4 KHz square wave on P2.1. Use timer 0 in model show all the calculations. **(08 Marks)**

c. Write the steps to program the timer of 8051 in mode 2. **(04 Marks)**

OR

8 a. In asynchronous method of communication how the framing is done explain with necessary diagram. Also mention the different pins of DB – 9 pin connector. **(08 Marks)**

b. A switch is connected to pin 2.0 monitor the status of the switch if SW = 0. Write an 8051C program to send the message 'READ' and if SW = 1 send the message 'WRITE' XTAL frequency = 11.0592MHz. **(08 Marks)**

c. Compare parallel and serial data transfer. **(04 Marks)**

Module-5

9 a. Name the external hardware interrupts present in 8051 and how the activation of them will be done. **(06 Marks)**

b. Write a program to read the data from port P1 and send it to P2 continuously. While incoming data from the serial port is sent to P0. Assume XTAL = 11.0592MHz set the baud rate at 2400. **(06 Marks)**

c. Write the interrupt priority upon reset in 8051. Also explain how the priority of the interrupts can be set using IP register. **(08 Marks)**

OR

10 a. Write a table to find the digital value to be send to DAC for generating sine wave in steps of 30°. Using the table write an assembly level program to generate a sine wave using DAC interfaced to microcontroller 8051. Assume full scale voltage for DAC is 10V and XTAL = 11.0592MHz. **(10 Marks)**

b. How draw the diagram to inter face a stepper motor to 8051MC. Also write a program to monitor the status of switch connected to port P2.7. If SW = 0. The stepper should rotate clockwise else it should rotate in anticlockwise direction. **(10 Marks)**

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CBCS SCHEME

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18ES51

Fifth Semester B.E. Degree Examination, July/August 2022
Technological Innovation Management & Entrepreneurship

Time: 3 hrs. Max. Marks: 100

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

Module-1

1	a.	Explain ten different roles played by managers.	**(10 Marks)**
	b.	Explain different management levels and skills using skill-mix diagram.	**(10 Marks)**
		OR	
2	a.	Explain the hierarchy of organizational plans with the help of a diagram.	**(10 Marks)**
	b.	Explain programmed and non-programmed decision making in management.	**(10 Marks)**

Module-2

3	a.	Explain the meaning and importance of span of management.	**(10 Marks)**
	b.	Explain different sources of recruitment.	**(10 Marks)**
		OR	
4	a.	Explain Maslow's need-hierarchy motivational theory with the help of neat diagram.	**(10 Marks)**
	b.	Explain five types of managerial styles using managerial grid chart.	**(10 Marks)**

Module-3

5	a.	Explain benefits and limitations of social audit.	**(10 Marks)**
	b.	Explain Corporate governance in India.	**(10 Marks)**
		OR	
6	a.	Explain different types of entrepreneurs.	**(10 Marks)**
	b.	Explain sociological models of entrepreneurial development.	**(10 Marks)**

Module-4

7	a.	Explain the stages of development of a family business.	**(10 Marks)**
	b.	Explain the characteristics of a family-owned business in India.	**(10 Marks)**
		OR	
8	a.	Explain different methods to generate business ideas.	**(10 Marks)**
	b.	Explain external changes which leads to the creation of opportunities.	**(10 Marks)**

Module-5

9	a.	Explain executive summary and management summary of business plans.	**(10 Marks)**
	b.	Explain government schemes for Micro, Small and Medium Enterprises (MSME).	**(10 Marks)**
		OR	
10	a.	Explain selection of a project for setting up an enterprise.	**(10 Marks)**
	b.	Explain two important ways of raising long-term debt fund.	**(06 Marks)**
	c.	List some advantages of PERT and CPM.	**(04 Marks)**

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CBCS SCHEME

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18EC53

Fifth Semester B.E. Degree Examination, July/August 2022
Principles of Communication Systems

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Illustrate the item domain and frequency domain characteristics of standard amplitude modulation produced by a single tone. **(10 Marks)**

b. Explain switching modulator with circuit diagram and characteristic curve. **(10 Marks)**

OR

2 a. Explain the generation of DSBSC wave using a Ring modulator. **(07 Marks)**

b. Explain the scheme of generation and demodulation of VSB modulated wave with relevant spectrum of signals and mathematical expressions. **(07 Marks)**

c. Explain with block diagram of FDM system. **(06 Marks)**

Module-2

3 a. Explain with block diagram generation of FM wave using PM and PM wave using FM. **(07 Marks)**

b. Explain the indirect method of generation FM wave with relevant equation and diagram. **(07 Marks)**

c. Explain FM stereo multiplexing. **(06 Marks)**

OR

4 a. Derive the expression for Linear model of PLL. **(08 Marks)**

b. Explain with diagram for superheterodyne receiver. **(08 Marks)**

c. Determine the bandwidth of an FM signal. If the maximum value of the frequency deviation Δf is fixed at 75KHz for commercial FM broadcasting by radio and modulation frequency is W = 15KHz. Bycarson's rule. **(04 Marks)**

Module-3

5 a. Derive the expression for figure of merit for DSB-SC receiver. **(07 Marks)**

b. Write short notes on :
i) Shot noise
ii) Thermal noise
iii) Whit noise. **(06 Marks)**

c. Find figure of merit for single tone AM. **(07 Marks)**

OR

6 a. With FM receiver model, derive the expression for figure of merit. **(07 Marks)**

b. Briefly explain the following as applicable to FM
i) Pre–emphasis
ii) De-emphasis. **(06 Marks)**

c. Explain about FM threshold effect and its reduction method. **(07 Marks)**

Module-4

7	a.	What are the advantages of digital signal over analog signal?	**(06 Marks)**
	b.	State sampling theorem and explain same with neat sketches and equation.	**(07 Marks)**
	c.	Explain with block diagram for TDM.	**(07 Marks)**

OR

8	a.	Explain with diagram the generation of PPM waves.	**(07 Marks)**
	b.	Explain the detection of PPM waves.	**(07 Marks)**
	c.	Explain the following terms : i) Under sampling ii) Over sampling iii) Nyquist rate.	**(06 Marks)**

Module-5

9	a.	Explain the midtread and midrise related to quantization noise.	**(06 Marks)**
	b.	Explain with diagram for pulse-code modulation.	**(07 Marks)**
	c.	Explain Delta modulation with transmitter and receiver systems.	**(07 Marks)**

OR

10	a.	Explain the unipolar NRZ, polar NRZ and Bipolar RZ with an example.	**(06 Marks)**
	b.	Write a note on MPEG + Video.	**(07 Marks)**
	c.	Explain Linear prediction coding VOCODER.	**(07 Marks)**

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

18EC54

Fifth Semester B.E. Degree Examination, July/August 2022
Information Theory and Coding

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Choose a facsimile transmission of a picture, which there are about 2.25×10^6 pixels/frame. For a good reproduction at the receiver 12 brightness levels are necessary. Assume all these levels are equally likely to occur. Find the rate of information if one picture is to be transmitted every 3 min. Also compute source efficiency. **(08 Marks)**

b. State and prove External property of Entropy. **(06 Marks)**

c. A zero memory source has alphabet S = {S_1 S_2 S_3} with P = $\left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{4}\right\}$. Find the entropy of this source. Also determine the entropy of its 2^{nd} extension and verify that $H(s^2) = 2H(s)$. **(06 Marks)**

OR

2 a. State and prove Extension of zero-memory source. **(08 Marks)**

b. For the first order Markoff source shown in Fig.Q2(b).
(i) Find the stationary distribution (ii) Find the entropy of each state and hence the entropy of the source (iii) Find the entropy of the adjoint source and verify that $H(s) < H(\bar{s})$.

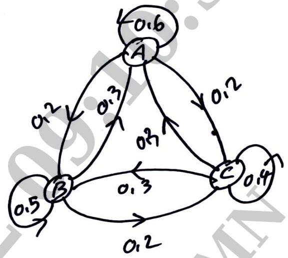

Fig.Q2(b) **(12 Marks)**

Module-2

3 a. Select a source S = {S_1 , S_2} with probabilities ¾ and ¼ respectively. Obtain Shannon Fano code for source S and its 2^{nd} extension. Calculate efficiencies for each case. **(10 Marks)**

b. Construct Huffman Binary Code and determine its efficiency for a source with 8 alphabets A to H with probabilities of
0.22, 0.20, 0.18, 0.15, 0.10, 0.08, 0.05, 0.02 . **(10 Marks)**

OR

4 a. Apply Shannon encoding algorithm for the following message and obtain efficiency, redundancy and draw code tree.
S = {S_1 S_2 S_3 S_4}
P = {0.4, 0.3, 0.2, 0.1} **(10 Marks)**

b. Explain with examples Prefix Codes. (min 4 examples two not prefix and two prefix.) **(06 Marks)**

c. State and explain Kraft's inequality. **(04 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

5 a. What is Mutual information? Mention its properties. **(04 Marks)**

b. The noise characteristics of a channel is as shown in Fig.Q5(b). Find the capacity of a channel using Muroga's method.

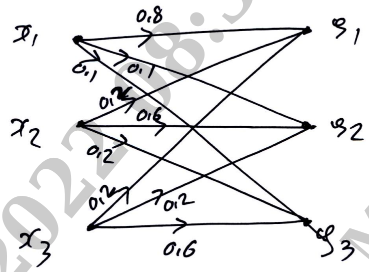

Fig.Q5(b) **(08 Marks)**

c. Explain Binary Symmetric and Binary Erroneous channel, with neat figure and JPM. **(08 Marks)**

OR

6 a. A binary symmetric channel has the following noise matrix

$$P(Y/X) = \begin{matrix} & y_1 & y_2 \\ x_1 & 3/4 & 1/4 \\ x_2 & 1/4 & 3/4 \end{matrix}$$

The source probabilities are $P(x_1) = 2/3$, $P(x_2) = 1/3$.

i) Determine H(x), H(y), H(x, y), H(y/x), H(x/y) and I(x,y)

ii) Find the channel capacity C

iii) Find channel η. **(08 Marks)**

b. What is Joint Probability matrix? Explain their properties. **(08 Marks)**

c. For the given channel matrix P(B/A), find H(B) by find P(A, B)

$$P(B/A) = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 1/4 & 3/4 & 0 & 0 \\ 0 & 1/3 & 2/3 & 0 \\ 0 & 0 & 1/3 & 2/3 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

The symbol probabilities are 0.2, 0.3, 0.2, 0.1 and 0.2. **(04 Marks)**

Module-4

7 a. Consider a (6, 3) linear block code whose generator matrix is given by

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

(i) Find all codewords.

(ii) Draw encoder circuit

(iii) Find minimum weight parity check matrix

(iv) Draw syndrome computation circuit. **(12 Marks)**

b. What is Syndrome Decoding Standard Array? Mention steps to decode using Syndrome Standard Array. **(08 Marks)**

OR

8 a. The generator polynomial of a (7, 4) cyclic code is $g(x) = 1 + x + x^3$, find the 16 code words of this code by forming the code polynomials V(x) using V(x) = D(x) g(x), where D(x) is message polynomial. **(10 Marks)**

b. For a (7, 4) cyclic code, the received vector Z(x) is 1110101 and the generator polynomial is $g(x) = 1 + x + x^3$. Draw the syndrome calculation circuit and correct the single error in the received vector. **(10 Marks)**

Module-5

9 a. Consider a (3, 1, 2) convolution encoder with g(1) = 110, g(2) = 101 and g(3) = 111
(i) Draw encoder diagram
(ii) Find the code word for the message sequence (11101) using (a) Generator Matrix / time Domain approach and (b) Transformation approach. **(15 Marks)**

b. Explain Viterbi decoding Algorithm. **(05 Marks)**

OR

10 a. Explain importance of Convolution Code. **(05 Marks)**

b. Construct (2, 1, 3) convolution encoder circuit with $g^1 = 1011$ and $g^2 = 1101$ and obtain
(i) State diagram
(ii) Code tree
(iii) The encoder output produced by the message sequence 11101 by traversing the code tree. **(15 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | | **18EC55**

Fifth Semester B.E. Degree Examination, July/August 2022
Electromagnetic Waves

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Convert point P(1, 3, 5) from Cartesian to cylindrical and spherical coordinates. Also write the equation for differential surface and differential volume for cylindrical and spherical system. **(08 Marks)**

b. A line charge of 2 nc/m lies along y-axis while surface charge densities of 0.1 and −0.1 nc/m^2 exist on the plane z = 3 and z = −4 respectively. Find the electric field intensity at a point (1, −7, 2). **(06 Marks)**

c. A point charge of 50 nc each are located at A(1, 0, 0), B(−1, 0, 0), C(0, 1, 0) and D(0, −1, 0) in free space. Find the total force on the charge at A. **(06 Marks)**

OR

2 a. Compute the value of $\overline{E}$ at P(1, 1, 1) caused by four identical 3nc charges located at $P_1(1, 1, 0)$, $P_2(-1, 1, 0)$, $P_3(-1, -1, 0)$ and $P_4(1, -1, 0)$. **(08 Marks)**

b. Define electric field intensity and flux density. Derive the expression for electric field intensity due to several point charges. **(06 Marks)**

c. Calculate the total charge for the defined volume. Given that $0.1 \le |x|, |y|, |z| \le 0.2$

$$\rho_V = \frac{1}{x^3y^3z^3}$$ **(06 Marks)**

Module-2

3 a. Evaluate both sides of divergence theorem for the defined plane in which $1 \le x \le 2$, $2 \le y \le 3$, $3 \le z \le 4$. $\overline{D} = 4x\overline{a}_x + 3y^2\overline{a}_y + 2z^3\overline{a}_z$ c/m^2. **(10 Marks)**

b. Determine workdone in carrying a charge of −2c from (2, 1, −1) to (8, 2, −1) in the electric field $\overline{E} = y\overline{a}_x + x\overline{a}_y$ V/m, (in Cartesian system). **(05 Marks)**

c. Considering the path along the parabola $x = 2y^2$, obtain the equation of continuity in integral and differential form. **(05 Marks)**

OR

4 a. Let $V = \frac{\cos 2\phi}{r}$ in the free space in cylindrical system:
(i) Find $\overline{E}$ at B(2, 30°, 1)
(ii) Find the volume charge density at point A(0.5, 60°, 1) **(08 Marks)**

b. Calculate the numerical value for div $\overline{D}$ at the point P(2, 3, −1) for
$\overline{D} = (2xyz - y^2)\overline{a}_x + (x^2z - 2xy)\overline{a}_y + x^2y\overline{a}_z$ c/m^2 **(06 Marks)**

c. Define potential difference. Derive the expression for potential due to several point charges. **(06 Marks)**

Module-3

5 a. Solve the Laplace's equation for the potential field in the homogeneous region between the two concentric conducting spheres with radii a and b, such that b > a if potential V = 0 at r = b and V = V_0 at r = a. Also find the capacitance between the two concentric spheres. **(09 Marks)**

b. State and explain Biot-Savart law. **(05 Marks)**

c. If the magnetic field intensity in a region is $\overline{H} = (3y-2)\overline{a}_z + 2x\overline{a}_y$. Find the current density at the origin. **(06 Marks)**

OR

6 a. State and prove uniqueness theorem. **(07 Marks)**

b. Find $\overline{E}$ at P(3, 1, 2) for the field of two coaxial conducting cylinders V = 50 V at ρ = 2m and V = 20 V at ρ = 3m. **(06 Marks)**

c. Evaluate both side of the Stoke's theorem for the filed $\overline{H} = 6xy\overline{a}_x - 3y^2\overline{a}_y$ A/m and the rectangular path around the region 2 ≤ x ≤ 5, −1 ≤ y ≤1, z = 0. Let the direction of $\overline{d}_s$ to be $\overline{a}_z$. **(07 Marks)**

Module-4

7 a. Obtain the expression for magnetic force between differential current elements. **(06 Marks)**

b. Calculate the normal components of the magnetic field which traversal from medium 1 to medium 2 having $\mu_{r_1} = 2.5$ and $\mu_{r_2} = 4$. Given that $\overline{H}_1 = -30\overline{a}_x + 50\overline{a}_y + 70\overline{a}_z$ V/m. **(06 Marks)**

c. Derive the integral and differential form of Faraday's law. **(08 Marks)**

OR

8 a. A current element $I_1dL_1 = 10^{-4}\overline{a}_z$ Am is located at P_1(2, 0, 0) and another current element $I_2dL_2 = 10^{-6}[\overline{a}_x - 2\overline{a}_y + 3\overline{a}_z]$ Am is located at P_2(−2, 0, 0). Both are in free space. Find:

(i) Force exerted on I_2dL_2 by I_1dL_1

(ii) Force exerted on I_1dL_1 by I_2dL_2 **(06 Marks)**

b. Calculate the magnetization in magnetic material where:

(i) μ= 1.8 × 10^5 (H/m) and M = 120 (A/m)

(ii) μ_r = 22, there are 8.3 × 10^{28} atoms/m^3 and each atom has a dipole moment of 4.5 × 10^{-27} (A/m^2)

(iii) B = 300 (μT) and χ_m = 15. **(06 Marks)**

c. Obtain the magnetic boundary conditions at interface between two different magnetic material. **(08 Marks)**

Module-5

9 a. List and explain Maxwell's equation in point form and integral form. **(06 Marks)**

b. Calculate intrinsic impedance η_1 the propagation constant γ and wave velocity υ for a conducting medium in which σ = 58 Ms/m, μ_r = 1, ε_r = 1 at a frequency of 100 MHz. **(06 Marks)**

c. The $\overline{H}$ field in free space is given by $\overline{H}(x,t) = 10\cos(10^8 t - \beta x)\overline{a}_y$ A/m. Find β, λ and E(x, t) at P(0.1, 0.2, 0.3) and t = 1 ns. **(08 Marks)**

OR

10 a. State and prove Poynthing theorem. **(08 Marks)**

b. A metal sheet of aluminium has σ = 38.2 M ℧/m and μ_r = 1. Calculate the skin depth δ, propagation constant γ and velocity of propagation v at the frequency of 1.6 MHz. **(06 Marks)**

c. Do the field $\overline{E} = E_m \sin x \sin t\, \overline{a}_y$ and $\overline{H} = \frac{E_m}{\mu_0}\cos x \cos t\, \overline{a}_z$. Satisfy Maxwell's equation. **(06 Marks)**

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18EC56

Fifth Semester B.E. Degree Examination, July/August 2022
Verilog HDL

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With neat block diagram of 4-bit Ripple carry counter. Explain the design hierarchy. **(10 Marks)**

b. Explain typical design flow for designing VLSI circuit, using the flow chart diagram. **(10 Marks)**

OR

2 a. What are the two styles of stimulus application? Explain each method in brief. **(08 Marks)**

b. Explain the following terms with examples : (i) module (ii) instances **(06 Marks)**

c. What are the advantages of verilog HDL? List out importance of HDL's. **(06 Marks)**

Module-2

3 a. What is ports? Explain the two methods of connecting Ports to external signals with examples. **(06 Marks)**

b. Explain the following data types with an example in verilog:
(i) Nets (ii) Register (iii) Vectors (iv) Parameters **(08 Marks)**

c. What are the basic components of module? Explain all components of verilog module. **(06 Marks)**

OR

4 a. What are the four values and eight strengths support in verilog HDL? List out in neat table. **(06 Marks)**

b. With example explain different types of lexical conventions. **(08 Marks)**

c. Declare following variables in verilog :
- (i) Decimal number 123 as a sized 8 bit number in binary. Use for readability.
- (ii) A 16-bit hexadecimal unknown number with all X's.
- (iii) A 4-bit negative 2 in decimal. Write the 2's complement form for this number.
- (iv) An unsized hex number 1234. **(06 Marks)**

Module-3

5 a. Write a verilog data flow description for 4-bit full adder with carry look ahead. **(10 Marks)**

b. What would be the output of the following:
a = 4′b1010 , b = 4′b1111
(i) a&b (ii) a&&b (iii) &a (iv) a>>1 (v) a>>>1
(vi) $y = \{2\{a\}\}$ (vii) $a \wedge b$ (viii) $z = \{a, b\}$ **(10 Marks)**

OR

6 a. Discuss AND/OR and NOT gates with respect to logic symbols, gate installation and truth table. **(10 Marks)**

b. Define butif/notif and write gate installation of bufit, notif gates. **(10 Marks)**

Module-4

7 a. Explain the blocking assignment statements and non blocking assignment statements with relevant examples. **(06 Marks)**

b. Write a verilog program for 8 : 1 mux using case statement and test bends. **(08 Marks)**

c. Using forever statement, design a clock with period time = 10 and duty cycle = 40%, initial value of clock is 0. **(06 Marks)**

OR

8 a. Explain sequential and parallel blocks with examples. **(06 Marks)**

b. Write the verilog behavioural description of a 4 bit binary counter with test cases. **(08 Marks)**

c. Using the for loop, initialize locations 0 to 1023 of a 4 bit register array cache_Var to 0. **(06 Marks)**

Module-5

9 a. Explain the synthesis flow for 4 bit magnitude comparator. **(10 Marks)**

b. Write a note on verification of gate-level netlist. **(10 Marks)**

OR

10 a. Write a note on : (i) Force and release (ii) defparam statement (iii) time scale (iv) file output **(10 Marks)**

b. Define the term logic synthesis with neat flow chart, explain computer Aided logic synthesis process. **(10 Marks)**

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CBCS SCHEME

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Sixth Semester B.E. Degree Examination, July/August 2022
Digital Communication

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. What are the applications of Hilbert transform? Prove that a signal g(t) and its Hilbert transform $\hat{g}(t)$ are orthogonal over the entire time interval $(-\infty, \infty)$. **(08 Marks)**

b. For a binary sequence 0 1 0 0 0 0 0 0 0 1 0 1 1 construct :
i) RZ Bipolar format ii) Manchester format iii) B3ZS format iv) B6ZS format
v) HDB3 format. **(08 Marks)**

c. Define Pre-envelope of a real valued signal. Given a band pass signal S(t), sketch the amplitude spectra of signal S(t), Pre-envelope $S_+(t)$ and Complex envelope $\tilde{S}(t)$. **(04 Marks)**

OR

2 a. Express Bandpass signal S(t) in canonical form. Also explain the scheme for deriving the in-phase and quadrature components of the band pass signal S(t). **(08 Marks)**

b. Derive the expression for the complex low pass representation of band pass systems. **(08 Marks)**

c. Write a note on HDBN signaling. **(04 Marks)**

Module-2

3 a. Explain the geometric representation of set of M energy signals as linear combination of N orthonormal basis functions. Illustrate for the case N = 2 and M = 3 with necessary diagrams and expressions. **(10 Marks)**

b. Explain the Correlation receiver using product integrator and matched filter. **(10 Marks)**

OR

4 a. Using the Gram – Schmidt Orthogonalization procedure, find a set of orthonormal basis functions to represent the three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ shown in Fig. Q4(a). Also express each of these signals in terms of the set of basis functions. **(12 Marks)**

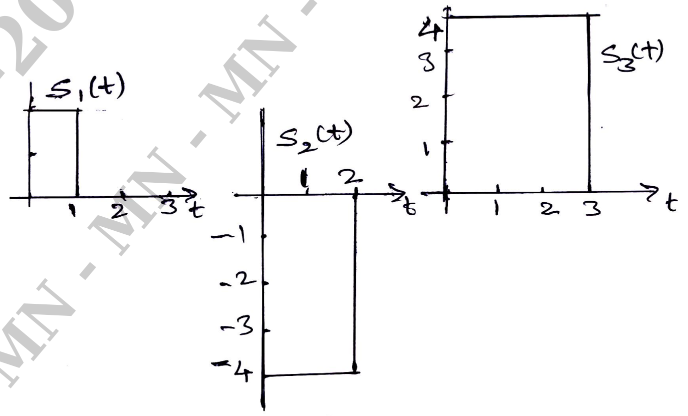

Fig. Q4(a)

b. Show that for a noisy input, the mean value of the j^{th} correlator output X_j depends only on S_{ij} and all the correlator outputs X_j , j = 1, 2, ……N have a variance equal to the PSD $N_0/2$ of the additive noise process W(t). **(08 Marks)**

Module-3

5 a. Derive the expression for error probability of binary PSK using coherent detection. **(06 Marks)**

b. Explain the generation and optimum detection of differential phase – shift keying, with neat block diagram. **(08 Marks)**

c. A binary data is transmitted over a microwave link at a rate of 10^6 bits/sec and the PSD of noise at the receiver is 10^{-10} watts/Hz. Find the average carrier power required to maintain an average probability of error $P_e \leq 10^{-4}$ for coherent binary FSK. What is the required channel bandwidth? (Given erf (2.6) = 0.9998). **(06 Marks)**

OR

6 a. With a neat block diagram, explain the non – coherent detection of binary frequency shift keying technique. **(08 Marks)**

b. In a FSK system, following data are observed. Transmitted binary data rate = 2.5×10^6 bits/second PSD of zero mean AWGN = 10^{-20} Watts/Hz. Amplitude of received signal in the absence of noise = 1μV. Determine the average probability of symbol error assuming coherent detection. (Given erf (2.5) = 0.99959). **(08 Marks)**

c. What is the advantage of M – ary QAM over M – ary PSK system? Obtain the constellation of QAM for M = 4 and draw signal space diagram. **(04 Marks)**

Module-4

7 a. With a neat block diagram, explain the digital PAM technique through band limited base band channels. Also obtain the expression for inter symbol interference. **(08 Marks)**

b. State and prove Nyquist condition for zero ISI. **(08 Marks)**

c. With neat diagram and relevant expression, explain the concept of adaptive equalization. **(04 Marks)**

OR

8 a. For a binary data sequence $\{d_n\}$ given by 1 1 1 0 1 0 0 1. Determine the precoded sequence, transmitted sequence, received sequence and the decoded sequence. **(06 Marks)**

b. Draw and explain the time – domain and frequency domain of duo – binary and modified duo binary signal. **(08 Marks)**

c. With neat diagram, explain the timing features pertaining to eye diagram and its interpretation for base band binary data transmission system. **(06 Marks)**

Module-5

9 a. Explain the model of a Spread Spectrum digital Communication system. **(08 Marks)**

b. Explain the effect of dispreading on a narrow band interference in Direct Sequence Spread Spectrum System (DSSS). A DSSS signal is designed to have the power ratio P_R/P_N at the intended receiver is 10^{-2}. If the desired $E_b/N_0 = 10$ for acceptable performance determine the minimum value of processing gain. **(08 Marks)**

c. What is a PN sequence? Explain the generation of maximum length (ML – Sequence). What are the properties of ML sequences? **(04 Marks)**

OR

10 a. With a neat block diagram, explain frequency Hopped Spread Spectrum Technique. Explain the terms Chip rate , Jamming Margin and Processing gain. **(10 Marks)**

b. With a neat block diagram, explain the CDMA System based on IS - 95. **(10 Marks)**

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CBCS SCHEME

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18EC62

Sixth Semester B.E. Degree Examination, July/August 2022
Embedded Systems

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 block Schematic, explain the function of various units in ARM cortex M3 processor architecture, in brief. **(10 Marks)**

b. Explain any 5 application of ARM cortex M3 based on its features. **(05 Marks)**

c. With diagram, explain 2 operation modes and 2 privilege levels in cortex M3, when exceptions are to be handled. **(05 Marks)**

OR

2 a. With tables, describe the various interrupts and exception along with the vector addresses. **(10 Marks)**

b. Explain Program Status Registers (PSRs) in cortex M3 along with the 2 instructions used for accessing PSRS, with a diagram. **(05 Marks)**

c. Describe the reset sequence with a diagram. **(05 Marks)**

Module-2

3 a. Explain the 16 bit instructions: CMP, ASR, SBC and LDMIA, with an example for each. **(08 Marks)**

b. Describe signed and unsigned saturation instructions with diagram and examples. **(08 Marks)**

c. Explain IT instruction with an example to convert a High level language instruction to its equivalent assembly instructions in cortex M3. **(04 Marks)**

OR

4 a. Explain the following 32 bit instructions with an example for each : ADC, BFC, LSL and PUSH. **(08 Marks)**

b. Describe CMSIS with diagram and its functions, organization and scope. **(08 Marks)**

c. Write an ALP to add the first 10 integer numbers using cortex M3 processor. **(04 Marks)**

Module-3

5 a. Describe the elements of an embedded system with a block diagram. **(10 Marks)**

b. Classify the embedded systems based on the complexities and give 2 examples for each category. **(06 Marks)**

c. Differentiate between RISC and CISC architectures. **(04 Marks)**

OR

6 a. Describe the functions of Optocoupler, I2C and IrDA for embedded system. **(10 Marks)**

b. Explain EPROM, EEPROM, FLASH, DRAM, NVRAM and Sensors required for embedded systems. **(06 Marks)**

c. Differentiate between Embedded and general computing systems. **(04 Marks)**

Module-4

7 a. Describe coin operated telephone system with a FSM, function of states and state transition diagram. **(08 Marks)**

b. Explain any 5 characteristics of embedded systems. **(05 Marks)**

c. With a block schematic, explain the ALP based embedded firmware design with its disadvantages. **(07 Marks)**

OR

8 a. Describe the sequential program model for seat belt warning system along with the operation of the system. **(08 Marks)**

b. Explain any 5 operational quality attributes of embedded systems. **(05 Marks)**

c. With a functional block diagram, explain the working of a washing machine. **(07 Marks)**

Module-5

9 a. With the state transition diagram, structure of a process and memory organization, explain the functions of status and the scheduler function for process management. **(10 Marks)**

b. With an example, describe preemptive SJF scheduling and calculate all the performance factors. **(10 Marks)**

OR

10 a. Describe out-of-circuit programming and In-system-programming. **(10 Marks)**

b. With a block diagram, explain the embedded system development environment with the functions of the components used in brief. **(10 Marks)**

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18EC63

Sixth Semester B.E. Degree Examination, July/August 2022
Microwave and Antennas

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Making use of functional block diagram explain the working of reflex Klystron oscillator. Also discuss modes of oscillation. **(10 Marks)**

b. A transmission line has the following parameters, R = 2Ω, G = 0.5mho/m, f = 1GHz, L = 8nH/m, C = 0.23PF.
Calculate :
i) Characteristic impedance
ii) Propagation constant. **(04 Marks)**

c. List the characteristics of smith chart. **(06 Marks)**

OR

2 a. A reflex Klystron is to be operated at frequency of 10GHz, with DC beam voltage 300V, repeller space 0.1cm for 1 mode, calculate P_{RFMax} and corresponding repeller voltage for a beam current of 20mA. **(04 Marks)**

b. Derive the equation of transmission line with possible solution. **(10 Marks)**

c. A certain transmission line has the characteristics impedance of 75 + j0.01Ω and is terminated in a load impedance of 70 + j50Ω.
Compute :
i) The reflection coefficient
ii) Transmission coefficient
iii) Standing wave ratio. **(06 Marks)**

Module-2

3 a. Prove that impedance and admittance matrices are symmetrical for a reciprocal junction. **(05 Marks)**

b. List the characteristics of magic – T when all the ports are terminated with matched load. Also derive the expression of S-matrix for magic T. **(10 Marks)**

c. In a H-plane T junction compute power delivered to the loads of 40Ω and 60Ω connected to arms 1 and 2 when a 10mW power is delivered to the matched port 3. **(05 Marks)**

OR

4 a. Derive the S-matrix representation for multiport network. Also define the losses interms of S-parameters. **(08 Marks)**

b. Explain briefly precision type variable attenuator. **(05 Marks)**

c. What are waveguide tees? Explain its basic types with neat diagram. **(07 Marks)**

Module-3

5 a. A lossless parallel strip line has a conducting strip width 'w'. The substrate dielectric separating the two conducting strips has a relative dielectric constant of 6(beryllium oxide) and thickness 'd' of 4 meter. Calculate :
   i) The required width 'w' of the conducting strip in order to have a characteristic impedance of 50Ω.
   ii) Strip line capacitance
   iii) Strip line inductance
   iv) Phase velocity. **(08 Marks)**

   b. Explain the following terms related to antenna system :
   i) Directivity
   ii) Beam area
   iii) Radiation pattern. **(06 Marks)**

   c. Determine the directivity of the system if radiation intensity is given by $U = U_m \text{ Sin } \theta \sin^2\phi$ using Exact method. Given that $0 \le \theta \le \pi$ and $0 \le \phi \le \pi$. **(06 Marks)**

OR

6 a. A microwave relay link is to be designed such a way that the transmitting and receiving antennas are separated to 30 statute miles. The directive gains of both the antennas are equal to 45db. Assuming both antennas are lossless and matched at 3GHz. Find what power is transmitted by the transmitter to have received power of 1MW. **(06 Marks)**

   b. Explain briefly losses in micro–strip line. **(06 Marks)**

   c. Calculate the directivity of the source with pattern $U = U_m \sin\theta^2 \sin^3\phi$ using :
   i) Exact method
   ii) Approximate method, where $0 \le \theta \le \pi$ and $0 \le \phi \le \pi$. **(08 Marks)**

Module-4

7 a. Obtain the field pattern for two point source situated symmetrically with respect to the origin. Two sources are feed with equal amplitude and equal phase signals, assume distance between two sources is $\frac{\lambda}{2}$. **(10 Marks)**

   b. Make use of poynthing theorem derive the expression for radiation resistance of short dipole with uniform current. **(10 Marks)**

OR

8 a. Derive an array factor expression in case of linear array of 'n' isotropic point sources of equal amplitude and spacing. **(10 Marks)**

   b. Starting from electric and magnetic potential, obtain the far field components for short dipole. **(10 Marks)**

Module-5

9 a. Derive the far field expression for small loop antenna. **(08 Marks)**

   b. Explain the constructional details for following antenna :
   i) Yogi – uda array
   ii) Parabolic reflector. **(12 Marks)**

OR

10 a. Derive the expression for radiation resistance of loop antenna. **(10 Marks)**

   b. Find the length L, H-plane aperture and flare angle θ_E and θ_H of pyramidal horn for which E –plane operators is 10λ horn is fed by a rectangular waveguide with TE_{10} mode. Assume $\delta = 0.2\lambda$ in E – plane and 0.375λ in H – plane. Also find E – plane, H – plane beam widths are directivity. **(10 Marks)**

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18EC644

Sixth Semester B.E. Degree Examination, July/August 2022
Digital System Design using Verilog

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Develop a verilog model for a 4:1 multiplexer. **(04 Marks)**

b. Explain with illustration, a simple design methodology followed in IC industries. **(08 Marks)**

c. Develop verilog model for a 7-segment decoder, include an additional input, blank that overrides the BCD input and causes all segments not to be lit. **(08 Marks)**

OR

2 a. With a neat block diagram, explain a design methodology for hardware/software co-design. **(10 Marks)**

b. Develop a verilog model of the priority encoder for use in a domestic burglar alarm that has sensors for each of eight zones. Sensor signal is '1' when an instrusion is detected in that zone and '0' otherwise. Zone 1 is having highest priority, down to zone 8 having lowest priority. **(10 Marks)**

Module-2

3 a. Determine whether there is an error in the ECC word 000111000100 and if so correct it. **(06 Marks)**

b. Design a 64K × 8 bit composite memory using four 16K × 8 bit components and also explain how memory components with tristate data outputs simplify the construction of larger memories. **(08 Marks)**

c. Explain about the multiport memories. **(06 Marks)**

OR

4 a. What is the difference between asynchronous static RAM and synchronous static RAM? **(08 Marks)**

b. Develop a verilog model of a dual port 4K × 16 bit flow through SSRAM. One port allows data to be written and read, while the other port allows data to be read. **(08 Marks)**

c. Compute the 12-bit ECC word corresponding to the 8-bit data word '01100001'. **(04 Marks)**

Module-3

5 a. Outline and explain the internal organization of FPGA. **(10 Marks)**

b. Briefly explain programmable array logic. **(10 Marks)**

OR

6 a. Explain the concept differential signaling. How does differential signaling improve noise immunity? **(10 Marks)**

b. What distinguishes a platform FPGA from a simple FPGA? **(05 Marks)**

c. Explain different types of PCB design. **(05 Marks)**

Module-4

7 a. With a neat diagram, explain R-string DAC and R/2R ladder DAC. **(10 Marks)**

b. Explain any four serial interface standards. **(10 Marks)**

OR

8 a. Explain any four analog sensors. **(10 Marks)**

b. Explain flash ADC and successive approximation ADC with the help of necessary diagrams. **(10 Marks)**

Module-5

9 a. Explain briefly area, power and timing optimization in digital circuits. **(10 Marks)**

b. Explain fault model and fault simulation. **(10 Marks)**

OR

10 a. Demonstrate Built-In Self Test (BIST) techniques. **(10 Marks)**

b. Explain the hardware and software co-design flow. **(10 Marks)**

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CBCS SCHEME

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18EC72

Seventh Semester B.E. Degree Examination, July/August 2022
VLSI Design

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Derive the expression for drain current in linear and saturation region for nmos transistor. **(10 Marks)**

b. Implement the following circuits using CMOS logic
i) Inverter
ii) Pass transistor. **(10 Marks)**

OR

2 a. Explain the non ideal IV effect of MOSFET with respect to CMOS Channel length modulation and also explain Noise Margin with diagram and equations. **(10 Marks)**

b. Implements the following circuits using CMOS logic
i) 2 input NAND gate
ii) Transmission gate. **10 Marks)**

Module-2

3 a. Describe with neat sketches the fabrication of P – well CMOS inverter. **(08 Marks)**

b. Explain the process of photolithography with a neat diagram in CMOS technologies. **(06 Marks)**

c. Draw the stick diagram for the following CMOS logic
i) $Y = \overline{A + B + C}$
ii) 2 input NAND gate. **(06 Marks)**

OR

4 a. Explain the layout Design Rules for MOS process with two metal layers. **(06 Marks)**

b. Draw the stick diagram for the CMOS logic $Y = \overline{(A + B + C)\,D}$ and estimate the cell area. **(06 Marks)**

c. Define scaling. Explain the constant voltage scaling and the effect of scaling on device characteristics. **(08 Marks)**

Module-3

5 a. Explain with a waveform the propagation Delay, Rise times and Fall Times of a CMOS inverter. **(08 Marks)**

b. Derive the equation of propagation Delay using RC Delay Model for a 1^{st} order system. **(06 Marks)**

c. Compute the Elmore Delay for V_{out} in the 2^{nd} order RC system. **(06 Marks)**

OR

6 a. Explain Parasitic Delay of common gates in Linear Delay Model. **(08 Marks)**

b. Design a circuit to compute F = AB + CD using NAND and NOR by Bubble pushing. **(06 Marks)**

c. Calculate the minimum delay in C to compute F = AB + CD using the circuits with NAND and NOR gates and with AOI gates. Each input can present a maximum of 20λ of transistor width. The output must derive a load equivalent to 100λ of transistor width. Choose transistor sizes to achieve this delay. **(06 Marks)**

Module-4

7 a. Explain Resettable Latches and FlipFlops using CMOs transmission Gate. **(10 Marks)**

b. Explain the Multistage pass transistor logic driven by two non overlapping clocks. **(10 Marks)**

OR

8 a. Explain conventional CMOs flipflops with neat diagrams. **(10 Marks)**

b. Explain Domino CMOS Logic. **(10 Marks)**

Module-5

9 a. Explain the operation of three transistor dynamic RAM cell. **(10 Marks)**

b. Explain Full CMOS static RAM cell with schematic diagram. **(10 Marks)**

OR

10 a. Write short notes on :

i) Built in Self Test (BIST)

ii) Scan Design Technology **(10 Marks)**

b. Explain briefly logic verification principle with a block diagram. **(10 Marks)**

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18EC81

Eighth Semester B.E. Degree Examination, July/August 2022
Wireless and Cellular Communication

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain in brief the basic three propagation mechanisms. **(06 Marks)**

b. Define :
i) Delay spread
ii) Coherence bandwidth
iii) Doppler spread
iv) Coherence time. **(08 Marks)**

c. Assume a receiver is located 10km from a 50W transmitter. The carrier frequency is 900MHz, free space propagation is assumed, $G_t = 1$, $G_r = 2$, find :
i) The power at the receiver
ii) The magnitude of E-field at the receiver antenna
iii) The rms voltage applied to the receiver input assuming that the receiver antenna has real impedance of 50Ω and is matched to the receivers. **(06 Marks)**

OR

2 a. Explain cell splitting and cell sectoring. **(06 Marks)**

b. Explain the three statistical channel model of a broadband fading channel. **(09 Marks)**

c. If a transmitter produces 50Watts of power, express the transmit power in units of
i) dBm and dBw
ii) if 50Watts is applied to a unity gain antenna with a 900MHz frequency of carrier, find the received power in dBm at a free space distance of 100m from the antenna. **(05 Marks)**

Module-2

3 a. Explain with neat block diagram GSM network architecture. **(10 Marks)**

b. Explain GSM Hyper frame with neat sketch. **(10 Marks)**

OR

4 a. Explain GSM identities. **(10 Marks)**

b. Explain the types of GSM location updating. **(10 Marks)**

Module-3

5 a. Explain the CDMA basic spectrum spreading operation with necessary sketches. **(10 Marks)**

b. Explain forward logical channels of CDMA. **(10 Marks)**

OR

6 a. Explain CDMA mobile station initialization and call processing states. **(12 Marks)**

b. Explain the types of handoff used in CDMA. **(08 Marks)**

Module-4

7	a.	Explain OFDM advantages and disadvantages.	**(10 Marks)**
	b.	Explain with neat block diagram flat LTE SAE architecture.	**(10 Marks)**

OR

8	a.	Explain the differences between OFDM and SCFDE with neat block diagrams.	**(10 Marks)**
	b.	Write a note on : i) Frequency synchronization ii) The Peak to Average Ratio (PAR)	**(10 Marks)**

Module-5

9	a.	Explain with neat block diagram OFDMA downlink transmitter.	**(10 Marks)**
	b.	Mention SC-FDMA advantages and disadvantages.	**(05 Marks)**
	c.	Mention OFDMA advantages and disadvantages.	**(05 Marks)**

OR

10	a.	Explain LTE end to end network architecture with neat block diagram.	**(10 Marks)**
	b.	Explain LTE frame structures.	**(10 Marks)**

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18EC821

Eighth Semester B.E. Degree Examination, July/August 2022
Network Security

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Discuss the four principles of security in detail, each with an example. **(10 Marks)**

b. List the examples of application level attacks or network level attacks each of which has arisen in a real world (student can explain any real time example). **(10 Marks)**

OR

2 a. Discuss the active attacks and passive attack in detail. **(10 Marks)**

b. Explain the specific attacks sniffing, spoofing, phishing. **(05 Marks)**

c. Describe the terms virus, worms and cookies. **(05 Marks)**

Module-2

3 a. Draw the secure socket layer protocol stack and describe the working in details. **(10 Marks)**

b. Discuss the four stage handshake protocol with neat diagram. **(10 Marks)**

OR

4 a. Draw the Secure Shell (SSH) Protocol and describe the working in detail. **(10 Marks)**

b. What is the importance of HTTPS? Explain the connection initiation and Cloure of HTTP in detail. **(10 Marks)**

Module-3

5 a. Draw the flow chart of processing for outbound packets and processing model inbound packets. **(10 Marks)**

b. What are the IPSec services and explain. **(05 Marks)**

c. Explain about the IPSec documents. **(05 Marks)**

OR

6 a. With neat diagram explain the scope of ESP encryption in Tunnel mode and Transport mode. **(10 Marks)**

b. Explain the Internet Key Exchange Process using Diffie-Hellman algorithm with an example. **(10 Marks)**

Module-4

7 a. Name the three classes of intruders. Describe the Intruder behaviour patterns. **(10 Marks)**

b. Explain the Rule Based intrusion techniques, intrusion detection. **(10 Marks)**

OR

8 a. Explain types of malicious software in detail. **(10 Marks)**

b. Brief about the multiple threat Malware. **(05 Marks)**

c. Describe the four phase of virus. **(05 Marks)**

Module-5

9	a.	List out firewall characteristics and explain in brief.	**(10 Marks)**
	b.	What are the limitations of firewalls?	**(05 Marks)**
	c.	What are the firewall attacks and counter measures?	**(05 Marks)**

OR

10	a.	Name the types of firewalls and explain in detail.	**(10 Marks)**
	b.	Discuss the firewall configuration with neat diagram and example.	**(10 Marks)**

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