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18MAT31

Third Semester B.E. Degree Examination, June/July 2024
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 of
i) $e^{-t}\cos^2 3t$ ii) $t\cos t$ **(06 Marks)**

b. A periodic function of period $\frac{2\pi}{\omega}$ is defined by

$$f(t)=\begin{cases} E\sin\omega t, & 0\le t\le \frac{\pi}{\omega} \\ 0, & \frac{\pi}{\omega}\le t\le \frac{2\pi}{\omega} \end{cases}$$ where E and ω are constants.

Show that $L\{f(t)\}=\frac{E\omega}{(s^2+\omega^2)(1-e^{-\pi s/\omega})}$ **(07 Marks)**

c. Find the Inverse Laplace transform of
i) $\frac{2s-1}{s^2+2s+17}$ ii) $\log\left(\frac{s^2+1}{s(s+1)}\right)$ **(07 Marks)**

OR

2 a. Express the function f(t) in terms of unit step function and find its Laplace transform, where

$$f(t)=\begin{cases} \cos t, & 0<t\le\pi \\ 1, & \pi<t\le 2\pi \\ \sin t, & t>2\pi \end{cases}$$ **(06 Marks)**

b. Using the convolution theorem, obtain inverse Laplace transform of $\frac{s}{(s+1)(s^2+1)}$ **(07 Marks)**

c. Solve the equation $y''+5y'+6y=e^t$ under the condition $y(0)=0,\ y'(0)=0$ **(07 Marks)**

Module-2

3 a. Find the Fourier series of the function $f(x)=x^2$ in $(-\pi,\pi)$. **(08 Marks)**

b. Define half range sine and cosine series in the interval $(0, l)$. **(04 Marks)**

c. Find the constant term and the first two harmonics in the fourier series for f(x) given by the following table.

x	0	π/3	2π/3	π	4π/3	5π/3	2π
f(x)	1.0	1.4	1.9	1.7	1.5	1.2	1.0

(08 Marks)

OR

4 a. Obtain the fourier series of the saw-tooth function

$f(x) = \frac{Ex}{T}$ for $0 < x < T$ given that $f(x + T) = f(x)$ for all $x > 0$. **(06 Marks)**

b. Obtain the Fourier series expansion of

$$f(x) = \begin{cases} \pi x & \text{in } 0 \le x \le 1 \\ \pi(2-x) & \text{in } 1 \le x \le 2 \end{cases}$$ over the interval (0, 2)

Deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots$ **(07 Marks)**

c. Expand $f(x) = \sin x$ in half range cosine series over the interval $(0, \pi)$. **(07 Marks)**

Module-3

5 a. Prove that fourier transform of

$$f(x) = \begin{cases} 1 + \frac{x}{a}, & -a < x < 0 \\ 1 - \frac{x}{a}, & 0 < x < a \\ 0, & \text{otherwise} \end{cases}$$ is $\frac{4\sin^2 \frac{au}{2}}{au^2}$, if Fourier transform of $f(x)$ is $F(u)$. **(06 Marks)**

b. Find the Fourier sine transform of $f(x) = e^{-|x|}$ and hence evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2} dx$, $m > 0$. **(07 Marks)**

c. Find z-transform of $5n^2 + 4\sin\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)$ **(07 Marks)**

OR

6 a. Find the fourier cosine transform of

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 < x < 2 \\ 0 & \text{for } x > 2 \end{cases}$$ **(07 Marks)**

b. Obtain the inverse z-transform of $\frac{4z^2 - 2z}{(z-1)(z-2)^2}$ **(07 Marks)**

c. Solve the difference equation

$u_{n+2} + 3u_{n+1} + 2u_n = 3^n$, given $u_0 = 0$, $u_1 = 1$, using z-transform. **(06 Marks)**

Module-4

7 a. Use Taylor's series method to find the value of y at $x = 0.1$, given that $dy/dx = x^2 + y^2$, $y(0) = 1$. Consider upto 4^{th} degree term. **(06 Marks)**

b. By using modified Euler's method, solve the initial value problem $\frac{dy}{dx} = \log(x + y)$, $y(1) = 2$ at the point $x = 1.2$. Take $h = 0.2$ and carryout two modifications. **(07 Marks)**

c. Given $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$, $y(0.1) = 1.1169$, $y(0.2) = 1.2773$, $y(0.3) = 1.5049$. Find $y(0.4)$ correct to three decimal places using Milne's predictor – corrector method. Apply corrector formula once. **(07 Marks)**

OR

8 a. Using modified Euler's method compute y(1.1) correct to five decimal places taking h = 0.1, given that $\frac{dy}{dx}+\frac{y}{x}=\frac{1}{x^2}$ and $y=1$ at $x=1$. **(06 Marks)**

b. Use fourth order Runge-Kutta method to find y at x = 0.1, given that $\frac{dy}{dx}=3e^x+2y$, y(0) = 0 and h = 0.1. **(07 Marks)**

c. Apply Adam's – 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 corrector formula once. **(07 Marks)**

Module-5

9 a. By Runge-Kutta method solve $y'' = xy'^2 - y^2$ for x = 0.2 correct to four decimal places, using initial conditions y = 1 and y′ = 0 when x = 0. Take step length h = 0.2. **(06 Marks)**

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

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

OR

10 a. Using Runge-Kutta method solve the differential equation at x = 0.1 under the given conditions:

$\frac{d^2y}{dx^2}=x^3\left(y+\frac{dy}{dx}\right)$, $y(0)=1$, $y'(0)=0.5$. Take step length h = 0.1. **(06 Marks)**

b. 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.

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

Apply corrector formula once. **(07 Marks)**

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

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18MATDIP31

Third Semester B.E. Degree Examination, June/July 2024
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Show that $(1+\cos\theta+i\sin\theta)^n+(1+\cos\theta-i\sin\theta)^n = 2^{n+1}\cos^n\left(\frac{\theta}{2}\right)\cdot\cos\left(\frac{n\theta}{2}\right)$ **(07 Marks)**

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

c. Find the argument of $\frac{1+i\sqrt{3}}{1-i\sqrt{3}}$ **(06 Marks)**

OR

2 a. If $\vec{A}=i+2j+3k$, $\vec{B}=-i+2j+k$ and $\vec{C}=3i+j$, find P such that $\vec{A}+P\vec{B}$ is perpendicular to $\vec{C}$. **(07 Marks)**

b. Find the area of the parallelogram whose adjacent sides are the vectors $\vec{A}=2i+4j-5k$ and $\vec{B}=i+2j+3k$. **(06 Marks)**

c. If $\vec{A}=4i+3j+k$ and $\vec{B}=2i-j+2k$, find a unit vector N form a right handed system. **(07 Marks)**

Module-2

3 a. Obtain the Maclaurin's series expansion of $\sin x$ up to term containing x^4. **(07 Marks)**

b. If $U=\sin^{-1}\left[\frac{x^2+y^2}{x-y}\right]$, prove that $x\frac{\partial U}{\partial x}+y\frac{\partial U}{\partial y}=\tan U$. **(07 Marks)**

c. If $U=f(x-y, y-z, z-x)$ prove that $\frac{\partial U}{\partial x}+\frac{\partial U}{\partial y}+\frac{\partial U}{\partial z}=0$. **(06 Marks)**

OR

4 a. Prove that $\log(1+x)=x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+\ldots\ldots$ by using Maclaurin's series notation. **(07 Marks)**

b. Using Euler's theorem prove that

$$x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=4u\log u, \text{ if } u=e^{\left(\frac{x^3y^3}{x^2+y^2}\right)}$$ **(07 Marks)**

c. If $u=x+y$, $v=y+z$ and $w=z+x$ then find $J\left(\frac{u,v,w}{x,y,z}\right)$. **(06 Marks)**

Module-3

5 a. A particle moves along a curve $x = e^{-t}$, $y = 2\cos 3t$ and $z = 2\sin 3t$, where t is the time variable. Determine the components of velocity and acceleration vectors at $t = 0$ in the direction of $i + j + k$. **(07 Marks)**

b. Find the unit normal to the surface $x^2y + 2xz = 4$ at $(2, -2, 3)$. **(06 Marks)**

c. Show that the vector field $\vec{F} = (4xy - z^3)i + (2x^2)j - (3xz^2)k$ is irrotational. **(07 Marks)**

OR

6 a. Find $\text{div}\,\vec{F}$ and $\text{curl}\,\vec{F}$ where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. **(07 Marks)**

b. If $\vec{F} = (3x^2y - z)i + (xz^3 + y^4)j - 2x^3z^2k$, find $\text{grad}(\text{div}\,\vec{F})$ at $(2, -1, 0)$. **(07 Marks)**

c. Find the value 'a' such that the vector field $\vec{F} = (x + 3y)i + (y - 2z)j + (x + az)k$ is Solenoidal. **(06 Marks)**

Module-4

7 a. Obtain the reduction formula for $\int_0^{\pi/2} \cos^n x\,dx$, $n > 0$. **(07 Marks)**

b. Evaluate $\int_0^1 \frac{x^9}{\sqrt{1-x^2}}\,dx$ **(06 Marks)**

c. Evaluate $\iint_C xy(x + y)dxdy$ over the area between $y = x^2$ and $y = x$. **(07 Marks)**

OR

8 a. Obtain the reduction formula for

$$\int_0^{\pi/2} \sin^n x\,dx, \quad n > 0$$ **(07 Marks)**

b. Evaluate $\int_0^{\infty} \frac{x^2}{(1+x^6)^{7/2}}\,dx$ **(06 Marks)**

c. Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dxdydz}{\sqrt{1-x^2-y^2-z^2}}$ **(07 Marks)**

Module-5

9 a. Solve $(4xy + 3y^2 - x)\,dx + x(x + 2y)\,dy = 0$ **(07 Marks)**

b. Solve $\frac{dy}{dx} + \frac{y}{x} = y^2x$ **(06 Marks)**

c. Obtain the solution of the differential equation

$$(1 + e^{x/y})dx + e^{x/y}\left(1 - \frac{x}{y}\right)dy = 0$$ **(07 Marks)**

OR

10 a. Solve : $\tan y\,dy = (\cos y \cos^2 x - \tan x)dx$ **(07 Marks)**

b. Solve : $\left[y\left(1 + \frac{1}{x}\right) + \cos y\right]dx + (x + \log x - x\sin y)dy = 0$ **(07 Marks)**

c. Solve : $(1 + y^2)dx = (\tan^{-1}y - x)\,dy$ **(06 Marks)**

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18EC32

Third Semester B.E. Degree Examination, June/July 2024
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. Derive the expression for,
(i) Δ to Y transformation
(ii) Y to Δ transformation **(10 Marks)**

b. Determine the equivalent resistance between A and B of the network shown in Fig. Q1 (b). **(10 Marks)**

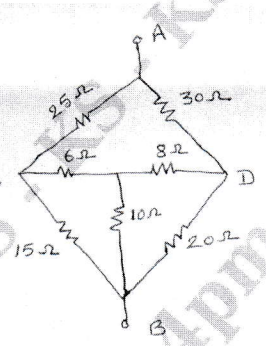

Fig. Q1 (b)

OR

2 a. Determine the current i_2 and voltage v_1 for the circuit shown in Fig. Q2 (a). **(10 Marks)**

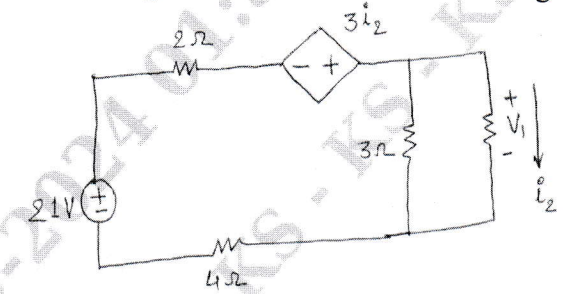

Fig. Q2 (a)

b. Determine the value of V_2, such that current through 4 Ω resistor is zero, using mesh current analysis method for the network shown in Fig.Q2 (b). **(10 Marks)**

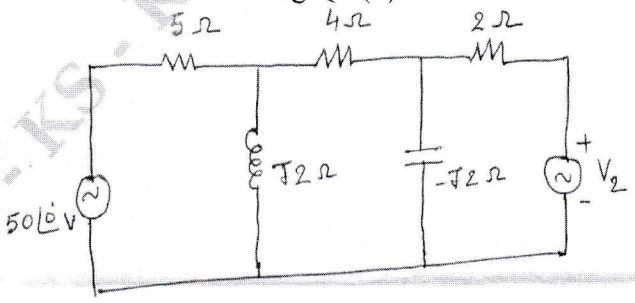

Fig. Q2 (b)

Module-2

3 a. State Super position theorem. Using superposition theorem, find the voltage V_1 across 3Ω resistor for the Network shown in Fig. Q3 (a). **(10 Marks)**

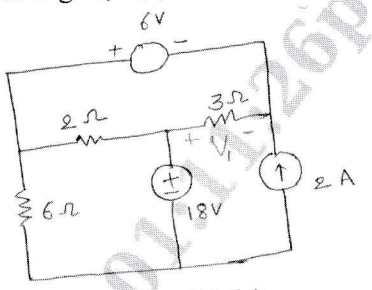

Fig. Q3 (a)

b. Evaluate the current through the load resistor R_L for the circuit shown in Fig. Q3 (b) using Millman's Theorem. **(10 Marks)**

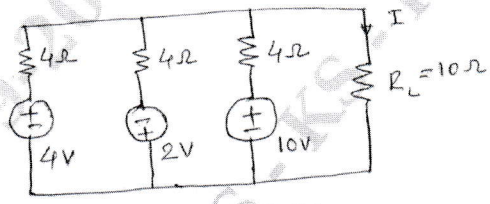

Fig. Q3 (b)

OR

4 a. Explain the procedure to find Norton's equivalent resistance in a network which has both dependent and independent sources with an example. **(06 Marks)**

b. Find the value of Z_L for which maximum power transfer occurs in the circuit shown in Fig. Q4 (b). **(04 Marks)**

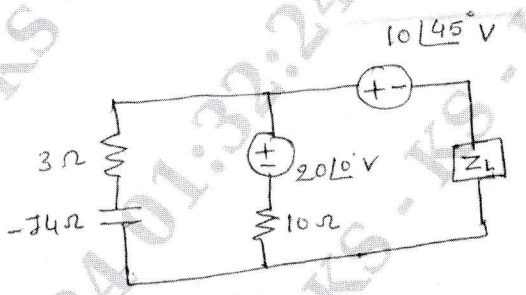

Fig.Q4 (b)

c. Determine the current flowing through the 6 Ω resistor for the circuit shown in Fig. Q4 (c) using Thevenin's theorem. **(10 Marks)**

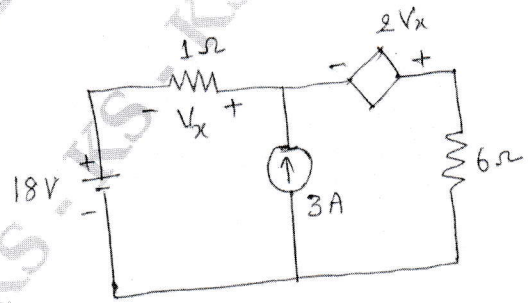

Fig. Q4 (c)

Module-3

5 a. Explain the transient behavior of R, L and C. Also explain the procedure for evaluating transient behavior. **(10 Marks)**

b. In the circuit shown in Fig. Q5 (b) the switch 'S' is moved from a to b at t = 0. Evaluate the values of i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$. If R = 1 Ω, L = 1 H, C = 0.1 μF and V = 100 V. Assume steady state is achieved when K is at 'a'. **(10 Marks)**

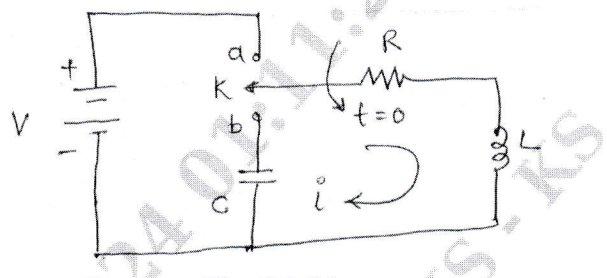

Fig. Q5 (b)

OR

6 a. Evaluate i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ for the circuit shown in Fig. Q6 (a), when switch K is changed from position 1 to 2 at t = 0, the steady state having been reached before switching. **(10 Marks)**

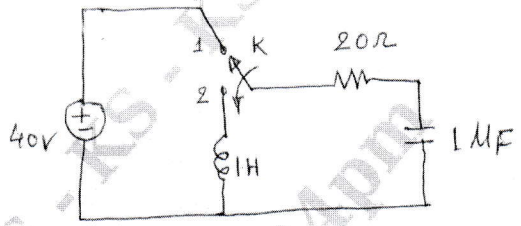

Fig. Q6 (a)

b. Find the values of i_1, i_2, $\frac{di_1}{dt}$, $\frac{di_2}{dt}$, $\frac{d^2i_1}{dt^2}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ for the circuit shown in Fig. Q6 (b). **(10 Marks)**

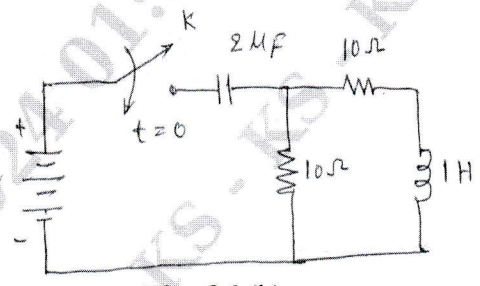

Fig. Q6 (b)

Module-4

7 a. Obtain Laplace transform of,
(i) Step function
(ii) Ramp function
(iii) Impulse function. **(10 Marks)**

b. Find the Laplace transform of the periodic waveform shown in Fig. Q7 (b). **(10 Marks)**

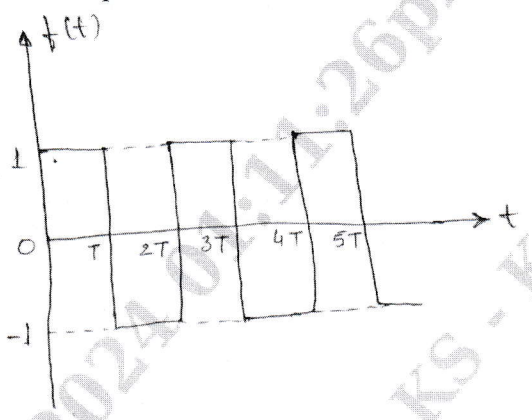

Fig. Q7 (b)

OR

8 a. Deduce the Laplace transform of the following :

(i) $\sin^2 t$

(ii) $\cos^2 t$

(iii) $\sin \omega t$ **(10 Marks)**

b. State and prove Initial and Final value theorems. **(10 Marks)**

Module-5

9 a. Express Z-parameters in terms of h-parameters and what are hybrid parameters. **(10 Marks)**

b. Determine the transmission parameters for the network shown in Fig. Q9 (b).

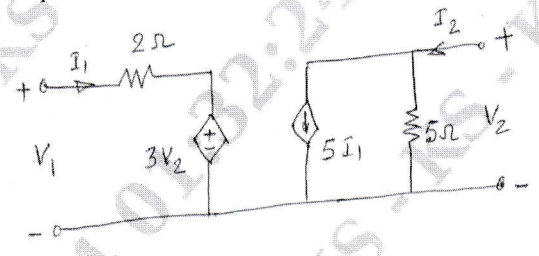

Fig. Q9 (b) **(10 Marks)**

OR

10 a. Define the followings :

(i) Resonance

(ii) Q-factor

(iii) Band width

(iv) Selectivity. **(08 Marks)**

b. Prove that the resonating frequency in a R-L-C series circuit is geometrical mean of half power frequencies is $f_0 = \sqrt{f_1 f_2}$. **(12 Marks)**

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CBCS SCHEME

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18EC33

Third Semester B.E. Degree Examination, June/July 2024
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. With neat diagrams, explain the different types of bonding forces in solids. **(06 Marks)**

b. Write explanatory notes on Intrinsic material with respect to electron hole pairs creation, generation rate and recombination rate. **(06 Marks)**

c. With a neat diagram, explain Hall effect and Hall voltage with necessary equations. Explain how Hall effect can be used to detect whether a given unknown sample of semi-conductor is p-type of n-type. **(08 Marks)**

OR

2 a. Explain the energy band structure of solids for insulator, semi-conductor and metal with neat diagram. **(04 Marks)**

b. With neat energy band diagrams and chemical bond model of dopants, explain the formation of n-type and p-type semi-conductors. **(08 Marks)**

c. Derive the expression for drift velocity of electrons with applied electric field. **(08 Marks)**

Module-2

3 a. With neat diagram, explain the effect of Forward bias of a p-n junction, with respect to transition width, electric field, electrostatic potential barrier, energy band diagram and particle flow and current direction within transition region 'W', **(08 Marks)**

b. Explain Zener Breakdown with neat energy band diagram. Explain the significance of impact ionization in Avalanche Breakdown with neat diagrams. Derive the expression for Electron multiplication factor M_n. **(08 Marks)**

c. Draw the Piecewise-Linear approximations of a junction diode and explain how a diode can be used as rectifier. **(04 Marks)**

OR

4 a. What are Photodiodes? Explain the significance of current in an illuminated junction and derive the equation for photodiode current and open circuit voltage V_{OC}. **(09 Marks)**

b. What are the necessary requirements to utilize maximum amount of optical energy to design a solar cell, with neat diagrams. **(05 Marks)**

c. Explain the principle of operation of Light Emitting Diode (LED) with necessary biasing and requirement of energy band gap energy. **(06 Marks)**

Module-3

5 a. With neat diagrams of normal biasing and I-V characteristics, explain the working of a p-n-p transistor. **(06 Marks)**

b. Derive the expression for 'α' and 'β' of a transistor in terms of base transport factor 'B' and emitter injection efficiency 'γ'. **(06 Marks)**

c. Starting from the current component of emitter current I_{EN} collects current I_{CN} in normal mode and I_{EI} and I_{CI} in inverted mode with hole concentrations Δ_{PE} and Δ_{PC}, derive the Ebers Moll equations. **(08 Marks)**

OR

6 a. With a neat equivalent circuit diagram, explain the coupled-diode property of Ebers Moll equations. **(08 Marks)**

b. With a neat switching circuit of BJT in common-emitter configuration, explain the switching operation. **(08 Marks)**

c. With a neat waveform of collector current during transient define the terms delay time (t_d), rise time (t_r) and fall time t_f. **(04 Marks)**

Module-4

7 a. With neat cross sectional diagrams, I-V characteristics and zero gate voltage, explain the effect of drain voltage on drain current. **(06 Marks)**

b. With a neat diagram, explain the small signal equivalent circuit of JFET, Arriving at ideal small-signal equivalent circuit derive the expression for the drain current I_{ds}. **(08 Marks)**

c. What are the two frequency limitation factors in a JFET? With small signal equivalent circuit with capacitance, derive the expression for cutoff frequency f_T. **(06 Marks)**

OR

8 a. With a cross section diagrams and circuit symbols, explain the operation of

i) a n-channel enhancement mode MOSFET

ii) a-n-channel depletion mode MOSFET. **(06 Marks)**

b. Explain the energy band diagrams of the MOS capacitor with a n-type substrate for various Gate biases. **(06 Marks)**

c. With neat cross section diagram and I_D versus V_{DS} curve when $V_{GS} > V_T$, explain the operation of the MOS structure for :

i) a small V_{DS} ii) a larger V_{DS} iii) $V_{DS} = V_{DS(sat)}$ iv) $V_{DS} > V_{DS(sat)}$. **(08 Marks)**

Module-5

9 a. With a neat Schematic diagram, explain Rapid Thermal Processing. **(06 Marks)**

b. Explain about Ion implantation with a neat Schematic diagram. **(08 Marks)**

c. With a neat diagram, explain Low Chemical Vapor Deposition (LPCVD). **(06 Marks)**

OR

10 a. Discuss the advantages of Integration of circuits. **(08 Marks)**

b. With a neat diagram of simplified description to steps describe the fabrication of p-n diodes on a wafer. **(08 Marks)**

c. Describe the types of Integrated circuits. **(04 Marks)**

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CBCS SCHEME

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18EC34

Third Semester B.E. Degree Examination, June/July 2024
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. Design a combinational logic circuit so that an output is generated indicating when a majority of four inputs is true. **(06 Marks)**

b. Place the following equations into the proper canonical form
i) $f(w, x, y, z) = \overline{w}x + y\overline{z}$ ii) $f(A, B, C, D) = A + \overline{B} + C)(\overline{A} + D)$ **(06 Marks)**

c. Using K-map determine minimal sum of product expressions and implement the simplified equation using only NAND gates $f(w, x, y, z) = \Sigma m(1, 2, 3, 4, 9) + \Sigma d(10, 11, 12, 13, 14, 15)$ **(08 Marks)**

OR

2 a. Define the following terms literal, canonical sum of products, Karnaugh Map, Prime implicatns. **(04 Marks)**

b. Find the minimal sum of the following Boolean function using Quine McClusky method $f(w, x, y, z) = \Sigma(1, 3, 13, 15) + \Sigma d(8, 9, 10, 11)$ **(08 Marks)**

c. Using K-map determine minimal product of sum expression and implement the simplified equation using only NOR gates $f(a, b, c, d) = \pi M(0, 4, 5, 7, 8, 9, 11, 12, 13, 15)$. **(08 Marks)**

Module-2

3 a. Implement following multiple output function using 74LS138 decoder
$F_1(A, B, C) = \Sigma m(1, 4, 5, 7)$
$F_2(A, B, C) = \pi m(2, 3, 6, 7)$ **(06 Marks)**

b. Explain 4-bit carry look ahead adder with necessary diagram and relevant expression. **(10 Marks)**

c. Implement $f(a, b, c, d) = \Sigma m(0, 1, 5, 6, 7, 9, 10, 15)$ using
8 : 1 MUX with a, b, c as select lines **(04 Marks)**

OR

4 a. Implement full adder using 74138 decoder. **(06 Marks)**

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

c. Design 4-line to 2 line priority uncoder which gives MSB the highest priority and LSB least priority. **(06 Marks)**

Module-3

5 a. What is race around condition? Explain JK master slave flip-flop with diagram function table and timing diagram. **(08 Marks)**

b. Explain the working of 4-bit Johnson counter using necessary diagram and waveform. **(06 Marks)**

c. Explain with a neat diagram and truth table, a 4-bit SIPO shift register to store binary number 1010. **(06 Marks)**

OR

6 a. Explain the operation of switch debouncer using SR latch with the help of circuit and waveform. **(06 Marks)**

b. Explain the working of 3-bit Asynchronous up-down counter with necessary waveform and truth table. **(10 Marks)**

c. Write the difference between combinational circuits and sequential circuits. **(04 Marks)**

Module-4

7 a. Design a synchronous Mod -6 counter using clocked D- Flip-Flop. **(10 Marks)**

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

OR

8 a. Construct the excitation table, transition table and state diagram for the sequential circuit shown in Fig Q8(a).

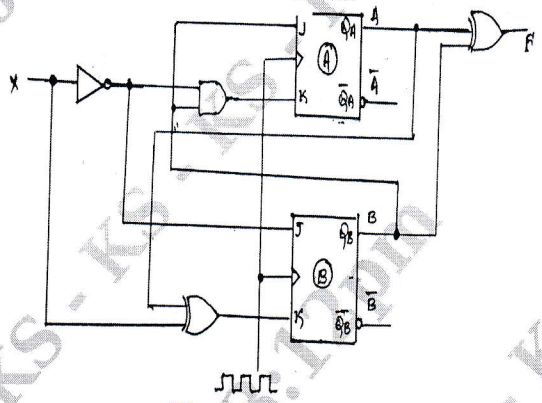

Fig Q8(a) **(10 Marks)**

b. Design a synchronous decade counter using T-flip flop and draw the logic diagram. **(10 Marks)**

Module-5

9 a. List the guidelines for construction of state graphs. **(10 Marks)**

b. Design a sequential circuit to convert BCD to excess – 3 code with state table state graph and transition table. **(10 Marks)**

OR

10 a. Explain with block diagram design of serial Adder with accumulator. **(10 Marks)**

b. Explain with block diagram design of Binary multiplier. **(10 Marks)**

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CBCS SCHEME

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18EC35

Third Semester B.E. Degree Examination, June/July 2024
Computer Organization and Architecture

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the operation of a computer with neat block diagram. **(10 Marks)**
b. Explain system software functions in detail. **(05 Marks)**
c. Explain bus structures. **(05 Marks)**

OR

2 a. Define byte addressability, Big-endian and Little-endian assignment **(06 Marks)**
b. Explain following registers :
i) PC ii) IR iii) MAR. **(06 Marks)**
c. Explain basic performance equation. **(08 Marks)**

Module-2

3 a. List and explain the generic addressing modes with assembler syntax and addressing function. **(10 Marks)**
b. What are assembler directives? Explain any five assembler directives. **(10 Marks)**

OR

4 a. Explain stack concepts with diagram. **(08 Marks)**
b. Explain shift and rotate operations with examples. **(06 Marks)**
c. List the steps involved in 'CALL' and 'RETURN' instructions. **(06 Marks)**

Module-3

5 a. Explain memory mapped I/O access. **(10 Marks)**
b. What is an interrupt? With an example explain the concept of interrupt. **(10 Marks)**

OR

6 a. Explain Daisy chain method used for handling simultaneous interrupt request. **(08 Marks)**
b. Explain the use of DMA controller in computer system. **(06 Marks)**
c. Explain the concept of vectored interrupt. **(06 Marks)**

Module-4

7 a. Explain the internal organization of 2M × 8 dynamic memory chip. **(10 Marks)**
b. Explain virtual memory organization. **(10 Marks)**

OR

8	a.	Explain secondary storage device.	**(08 Marks)**
	b.	Explain cache memory and its relevant terms.	**(06 Marks)**
	c.	Explain different types of non volatile memory.	**(06 Marks)**

Module-5

9	a.	Discuss the single bus organization of data path inside a processor.	**(10 Marks)**
	b.	Draw and explain multiple bus organization of CPU.	**(10 Marks)**

OR

10	a.	Explain block diagram of a complete processor.	**(08 Marks)**
	b.	Explain micro programmed control concept.	**(06 Marks)**
	c.	Discuss the organization of hardwired controlled unit.	**(06 Marks)**

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18EC36

Third Semester B.E. Degree Examination, June/July 2024
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. Explain the V.I. characteristics of SCR by clearly indicating different states on characteristic. Also explain different modes of operation. **(10 Marks)**

b. Explain the UJT Relaxation oscillator circuit working with circuit diagram and waveforms. **(10 Marks)**

OR

2 a. Explain class A – self commutation by resonating the load with proper circuit and waveforms. **(10 Marks)**

b. What are the gate triggering schemes? Explain the operation of resistor-capacitor firing circuit with appropriate waveforms. **(10 Marks)**

Module-2

3 a. Explain the effect of freewheeling diode with a neat circuit diagram and waveform for single phase half wave controlled rectifier with RL load. **(10 Marks)**

b. Explain the principle of step up chopper with a neat circuit diagram and waveforms. Also derive the expression for output voltage. **(10 Marks)**

OR

4 a. If the half wave controlled rectifier has a purely resistive load R and the delay angle is $\alpha = \frac{\pi}{3}$. Identify: (i) Rectification efficiency (ii) Form factor (iii) Ripple factor (iv) TUF (v) PIV **(10 Marks)**

b. Explain the principle of step up / down chopper with a neat circuit diagram and waveforms. Also derive the expressions for output voltage. **(10 Marks)**

Module-3

5 a. Explain the working of single phase half bridge inverter connected to RL load with the help of necessary circuit diagram and waveforms. **(10 Marks)**

b. Explain the working of continuous mode fly back converter with necessary circuit diagram and waveform. **(10 Marks)**

OR

6 a. Define the following terms as applied to an electronic instrument:
(i) Instrument (ii) Measurement (iii) Accuracy (iv) Resolution
(v) Precision (vi) Expected value (vii) Error (viii) Sensitivity **(10 Marks)**

b. Sketch and explain the operation of a multirange voltmeter. **(10 Marks)**

Module-4

7 a. Discuss the operation of dual slope integrating type DVM with the help of block diagram. **(10 Marks)**

b. Explain the operation of the Wein's bridge with a neat circuit diagram. Derive the expression for the frequency. **(10 Marks)**

OR

8 a. Explain the operation of a function generator with the help of block diagram. **(10 Marks)**

b. With the aid of diagram, explain the working of balanced wheat stone bridge and derive for a galvanometer current expression. **(10 Marks)**

Module-5

9 a. Explain the construction, working principle and operation of LVDT. Show the characteristics curve. **(10 Marks)**

b. Explain the construction of temperature indicators using thermistor. **(10 Marks)**

OR

10 a. Explain the construction and working of instrumentation amplifier using transducer bridge. **(10 Marks)**

b. Explain the structure and operation of programmable logic controller. **(10 Marks)**

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