CBCS SCHEME

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18MAT31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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.***

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. Find the Laplace transform of:

(i) $\left(\frac{4t+5}{e^{2t}}\right)^2$ (ii) $\left(\frac{\sin 2t}{\sqrt{t}}\right)^2$ (iii) $t\cos at$. **(10 Marks)**

b. The square wave function f(t) with period 2a defined by $f(t)=\begin{cases}1 & 0\le t<a\\ -1 & a\le t<2a\end{cases}$. Show that $\left(\frac{1}{s}\right)\tanh\left(\frac{as}{2}\right)$. **(05 Marks)**

c. Employ Laplace transform to solve $\frac{d^2y}{dt^2}-\frac{dy}{dt}=0,\ y(0)=y_1(0)=3$. **(05 Marks)**

OR

2 a. Find (i) $L^{-1}\left\{\frac{s^2-3s+4}{s^3}\right\}$ (ii) $\cot^{-1}\left(\frac{s}{2}\right)$ (iii) $L^{-1}\left\{\frac{s}{(s+2)(s+3)}\right\}$ **(10 Marks)**

b. Find the inverse Laplace transform of, $\frac{1}{s(s^2+1)}$ using convolution theorem. **(05 Marks)**

c. Express $f(t)=\begin{cases}2 & \text{if } 0<t<1\\ \frac{t^2}{2} & \text{if } 1<t<\frac{\pi}{2}\\ \cos t & t>\frac{\pi}{2}\end{cases}$ in terms of unit step function and hence find its Laplace transformation. **(05 Marks)**

Module-2

3 a. Obtain the Fourier series of $f(x)=\begin{cases}2 & -2<x<0\\ x & 0<x<2\end{cases}$. **(08 Marks)**

b. Find the half range cosine series of, $f(x)=(x+1)$ in the interval $0\le x\le 1$. **(06 Marks)**

c. Express $f(x)=x^2$ as a Fourier series of period 2π in the interval $0<x<2\pi$. **(06 Marks)**

OR

4 a. Compute the first two harmonics of the Fourier Series of f(x) given the following table :

x°	0	60°	120°	180°	240°	300°
y	7.9	7.2	3.6	0.5	0.9	6.8

(08 Marks)

b. Find the half range size series of e^x in the interval $0 \le x \le 1$. **(06 Marks)**

c. Obtain the Fourier series of $f(x) = \frac{\pi^2}{12} - \frac{x^2}{4}$ valid in the interval $(-\pi \quad \pi)$ **(06 Marks)**

Module-3

5 a. Find the Infinite Fourier transform of $e^{-|x|}$. **(07 Marks)**

b. Find the Fourier cosine transform of $f(x) = e^{-2x} + 4e^{-3x}$. **(06 Marks)**

c. Solve $u_{n+2} - 3u_{n+1} + 2u_n = 3^n$, given $u_0 = u_1 = 0$. **(07 Marks)**

OR

6 a. If $f(x) = \begin{cases} 1 & \text{for } |x| \le a \\ 0 & \text{for } |x| > a \end{cases}$, find the infinite transform of f(x) and hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$. **(07 Marks)**

b. Obtain the Z-transform of $\cosh n\theta$ and $\sinh n\theta$. **(06 Marks)**

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

Module-4

7 a. Solve $\frac{dy}{dx} = e^x - y$, $y(0) = 2$ using Taylor's Series method upto 4th degree terms and find the value of y(1.1). **(07 Marks)**

b. Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx} + y = 2x$ at x = 1.1 given $y(1) = 3$ (Take h = 0.1) **(06 Marks)**

c. Apply Milne's predictor-corrector formulae to compute y(0.4) given $\frac{dy}{dx} = 2e^x y$, with **(07 Marks)**

x	0	0.1	0.2	0.3
y	2.4	2.473	3.129	4.059

OR

8 a. Given $\frac{dy}{dx} = x + \sin y$; $y(0) = 1$. Compute y(0.4) with h = 0.2 using Euler's modified method. **(07 Marks)**

b. Apply Runge-Kutta fourth order method, to find y(0.1) with h = 0.1 given $\frac{dy}{dx} + y + xy^2 = 0$; $y(0) = 1$. **(06 Marks)**

c. Using Adams-Bashforth method, find y(4.4) given $5x\left(\frac{dy}{dx}\right) + y^2 = 2$ with

x	4	4.1	4.2	4.3
y	1	1.0049	1.0097	1.0143

(07 Marks)

Module-5

9 a. Solve by Runge Kutta method $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$ for x = 0.2 correct 4 decimal places, using initial conditions $y(0) = 1$, $y'(0) = 0$, $h = 0.2$. **(07 Marks)**

b. Derive Euler's equation in the standard form, $\frac{\partial f}{\partial y} - \frac{d}{dx}\left[\frac{\partial f}{\partial y'}\right] = 0$. **(06 Marks)**

c. Find the extramal of the functional, $\int_{x_1}^{x_2} y^2 + (y')^2 + 2ye^x dx$. **(07 Marks)**

OR

10 a. Apply Milne's predictor corrector method to compute $\frac{d^2y}{dx^2} = 1 + \frac{dy}{dx}$ and the following table of initial values:

x	0	0.1	0.2	0.3
y	1	1.1103	1.2427	1.3990
y′	1	1.2103	1.4427	1.6990

(07 Marks)

b. Find the extramal for the functional, $\int_0^{\frac{\pi}{2}} [y^2 - y'^2 - 2y\sin x]dx$; $y(0) = 0$; $y\left(\frac{\pi}{2}\right) = 1$. **(06 Marks)**

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

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18MATDIP31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Additional Mathematics – I

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. Express the following complex number in the form of $x+iy$: $\frac{(1+i)(1+3i)}{1+5i}$. **(06 Marks)**

b. Prove that $\left(\frac{\cos\theta+i\sin\theta}{\sin\theta+i\cos\theta}\right)^4 = \cos 8\theta + i\sin 8\theta$. **(07 Marks)**

c. If $\vec{a}=(3,-1,4)$, $\vec{b}=(1,2,3)$ and $\vec{c}=(4,2,-1)$, find $\vec{a}\times\left(\vec{b}\times\vec{c}\right)$. **(07 Marks)**

OR

2 a. Find the angle between the vectors, $\vec{a}=5\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=2\hat{i}-3\hat{j}+6\hat{k}$. **(06 Marks)**

b. Prove that $\left[\vec{a}\times\vec{b}, \vec{b}\times\vec{c}, \vec{c}\times\vec{a}\right] = \left[\vec{a},\vec{b},\vec{c}\right]^2$ **(07 Marks)**

c. Find the fourth roots of $-1+i\sqrt{3}$ and represent them on the argand diagram. **(07 Marks)**

Module-2

3 a. Obtain the Maclaurin's expansion of $\log_e(1+x)$. **(06 Marks)**

b. If $u=\sin^{-1}\left[\frac{x^3+y^3}{x+y}\right]$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=2\tan u$. **(07 Marks)**

c. If $u=x(1-y)$, $v=xy$, find $\frac{\partial(u,v)}{\partial(x,y)}$. **(07 Marks)**

OR

4 a. Obtain the Maclauvin's series expansion of the function $\log_e \sec x$. **(06 Marks)**

b. If $u=x^2-2y$; $v=x+y$ find $\frac{\partial(u,v)}{\partial(x,y)}$. **(07 Marks)**

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

Module-3

5 a. Find the velocity and acceleration of a particle moves along the curve, $\vec{r}=e^{-2t}\hat{i}+2\cos 5t\hat{j}+5\sin 2t\hat{k}$ at any time t. **(06 Marks)**

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

c. Show that $\vec{F}=(2xy+z^2)\hat{i}+\left(x^2+2yz\right)\hat{j}+\left(y^2+2xz\right)\hat{k}$ is conservative force field and find the scalar potential. **(07 Marks)**

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OR

6 a. Show that the vector field, $\vec{F} = (3x + 3y + 4z)\hat{i} + (x - 2y + 3z)\hat{j} + (3x + 2y - z)\hat{k}$ is solenoidal. **(06 Marks)**

b. Find the directional derivative of $\phi = \frac{xz}{x^2 + y^2}$ at (1, −1, 1) in the direction of $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$. **(07 Marks)**

c. Find the constant 'a' such that the vector field $\vec{F} = 2xy^2z^2\hat{i} + 2x^2yz^2\hat{j} + ax^2y^2z\hat{k}$ is irrotational. **(07 Marks)**

Module-4

7 a. Find the reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$. **(06 Marks)**

b. Evaluate $\int_0^1 \int_0^3 x^3y^3 dxdy$. **(07 Marks)**

c. Evaluate $\int_0^3 \int_0^2 \int_0^1 (x + y + z) dzdxdy$. **(07 Marks)**

OR

8 a. Evaluate : $\int_0^{\frac{\pi}{6}} \sin^6(3x) dx$. **(06 Marks)**

b. Evaluate : $\int_0^1 \int_x^{\sqrt{x}} xy\, dydx$. **(07 Marks)**

c. Evaluate : $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} xyz dzdydx$. **(07 Marks)**

Module-5

9 a. Solve : $\frac{dy}{dx} + y\cot x = \sin x$. **(06 Marks)**

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

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

OR

10 a. Solve : $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$. **(06 Marks)**

b. Solve : $\frac{dy}{dx} + x\sin 2y = x^3\cos^2 y$. **(07 Marks)**

c. Solve : $[1 + (x + y)\tan y]\frac{dy}{dx} + 1 = 0$. **(07 Marks)**

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CBCS SCHEME

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18EC32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Network Theory

Time: 3 hrs. Max. Marks: 100

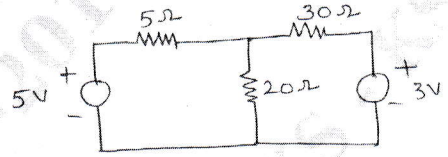
Note: Answer any FIVE full questions, choosing ONE full question from each module.

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

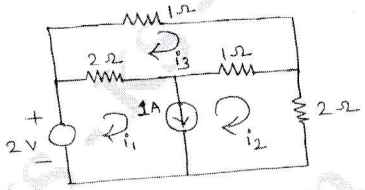
1 a. Using source transformation technique find the current through 5Ω resistor for the circuit shown in Fig.Q.1(a). **(06 Marks)**

Fig.Q.1(a)



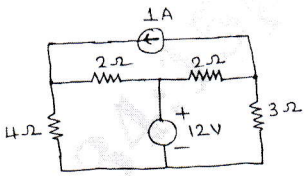
b. Use Mesh Analysis to determine the Mesh currents i_1, i_2 and i_3 for the network shown in Fig.Q.1(b). **(06 Marks)**

Fig.Q.1(b)



c. Find the power delivered by 1A current source using nodal analysis for the circuit shown in Fig.Q.1(c). **(08 Marks)**

Fig.Q.1(c)

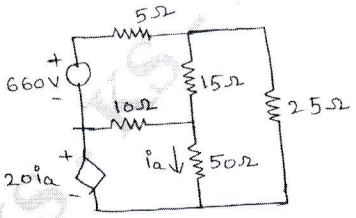


OR

2 a. Three Impedances are connected in delta, obtain the star equivalent of the network. **(06 Marks)**

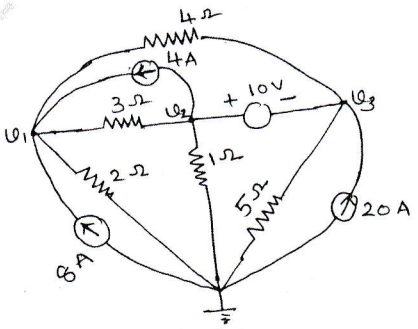
b. Use Mesh Analysis to find the power delivered by the dependent voltage source in the circuit shown in Fig.Q.2(b). **(06 Marks)**

Fig.Q.2(b)



c. Determine all the node voltages for the circuit shown in Fig.Q.2(c) using nodal analysis. **(08 Marks)**

Fig.Q.2(c)



Module-2

3 a. State and explain superposition theorem **(06 Marks)**

b. Use Millman's Theorem to find the current flowing through $(2 + j3)\Omega$ impedance for the circuit shown in Fig.Q.3(b). **(08 Marks)**

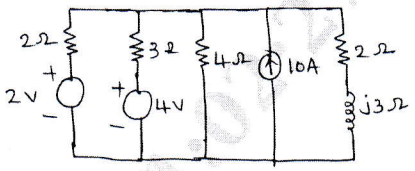


Fig.Q.3(b)

c. State and prove Norton's theorem. **(06 Marks)**

OR

4 a. Find the Thevenin's equivalent for the circuit shown in Fig.Q.4(a) with respect to terminals X-Y. **(08 Marks)**

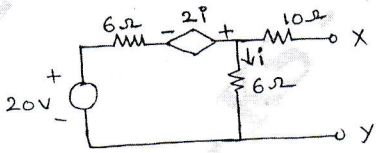


Fig.Q.4(a)

b. Find the condition for maximum power transfer in the AC circuit, where both R_L and X_L are varying. **(06 Marks)**

c. Determine the current through the load resistance using Norton's Theorem for the circuit shown in Fig.Q.4(c). **(06 Marks)**

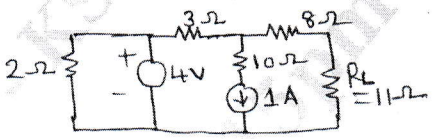


Fig.Q.4(c)

Module-3

5 a. Explain the behavior of R, L, C elements at the time of switching at $t = 0$, at $t = 0^+$ and $t = \infty$. **(07 Marks)**

b. In the network shown in Fig.Q.5(b). Find i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. Assume that the capacitor is initially uncharged. **(07 Marks)**

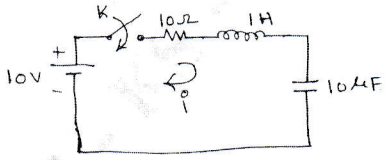


Fig.Q.5(b)

c. In the network shown in Fig.Q.5(c) find, i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. The swich k is closed at $t = 0$ with zero current in the inductor. **(06 Marks)**

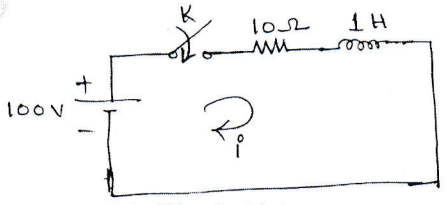


Fig.Q.5(c)

OR

6 a. In the network shown in Fig.Q.6(a). The switch k is changed from position a to b at t = 0, the steady state is reached at position a. Find i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. Assume that the capacitor is initially uncharged. **(10 Marks)**

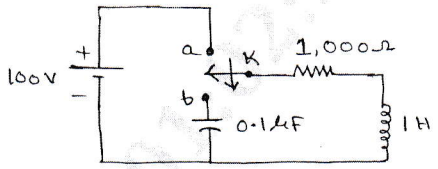


Fig.Q.6(a)

b. For the network shown in Fig.Q.6(b). The network is in steady state with switch k is closed. At t = 0, the switch is opened. Determine the voltage across the switch V_k and $\frac{d}{dt}V_k$ at $t = 0^+$. **(10 Marks)**

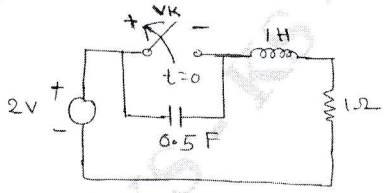


Fig.Q.6(b)

Module-4

7 a. Obtain Laplace transform of
i) Step function
ii) Ramp function
iii) Impulse function. **(09 Marks)**

b. Find the Laplace transform of the periodic signal x(t) as shown in Fig.Q.7(b). **(11 Marks)**

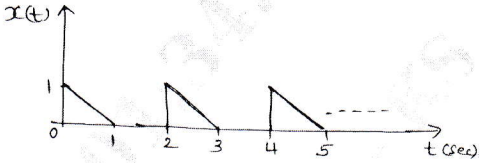


Fig.Q.7(b)

OR

8 a. In the series RL circuit shown in Fig.Q.8(a), the source voltage is v(t) = 50 sin 250tV. Using Laplace transform determine, the current when switch K is closed at t = 0. **(10 Marks)**

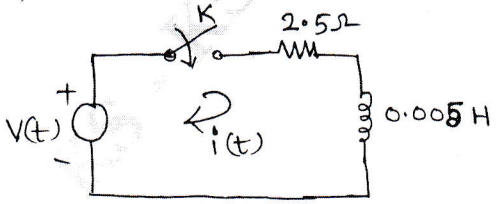


Fig.Q.8(a)

b. Find the Laplace transform of the non-sinusoidal periodic waveform shown in Fig.Q.8(b)

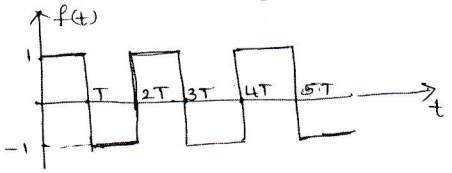


Fig.Q.8(b) **(10 Marks)**

Module-5

9 a. Define Z parameters. Determine Z parameters interms of Y parameters. **(06 Marks)**

b. Determine h parameters of the circuit shown in Fig.Q.9(b) **(07 Marks)**

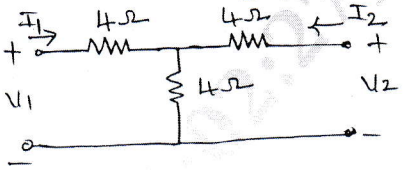


Fig.Q.9(b)

c. For the network shown in Fig.Q.9(c). Find the transmission parameters. **(07 Marks)**

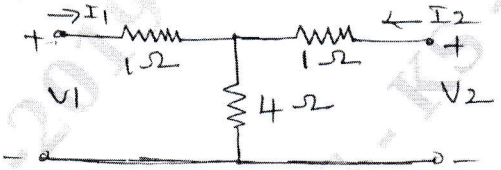


Fig.Q.9(c)

OR

10 a. Define Q-factor, selectivity and Band width. **(03 Marks)**

b. A series RLC circuit has a resistance of 10Ω, an inductance of 0.3H and a capacitance of 100μF. The applied voltage is 230V. Find: i) The resonant frequency ii) lower and upper cut off frequencies iii) current at resonance iv) currents at f_1 and f_2 v) Voltage across. the inductance at resonance. **(07 Marks)**

c. Derive the expression for the resonant frequency of the circuit shown in Fig.Q.10(c). Also show that the circuit will resonate at all frequency if $R_L = R_C = \sqrt{\frac{L}{C}}$. **(10 Marks)**

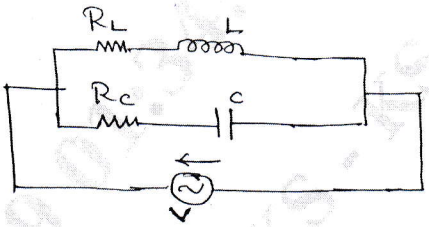


Fig.Q.10(c)

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18EC33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electronic Devices

Time: 3 hrs. Max. Marks: 100

Note: ***Answer 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. What are the types of Bonding forceses in solids? Explain. **(06 Marks)**

b. Explain the classification of material based on conductivity and energy band diagram. **(08 Marks)**

c. Find the conductivity of the intrinsic germanium at 300 K. If a donar type impurity is added to the extent of 1 atom/10^7 germanium atom assume $\mu_n = 3800$, $\mu_P = 1800$, $n_i = 2.5 \times 10^3$, $Q = 1.602 \times 10^{-19}$. **(06 Marks)**

OR

2 a. What are Direct and Indirect band gap semiconductor? Explain with examples. **(08 Marks)**

b. Explain the concentration of electron-hole pair in Intrinsic semiconductor with energy band diagram. **(06 Marks)**

c. Calculate the Intrinsic carrier concentration in Silicon at room temperature T = 300 K, where B is the material dependent parameter 5.4×10^{31} and E_G as the bandgap energy 1.12 eV, where K is the Boltzman constant = 8.62×10^{-5} eV/K. **(06 Marks)**

Module-2

3 a. With energy band diagram, explain the doping level in extrinsic semiconductor at 0 K and at 50 K. **(09 Marks)**

b. What is the magnitude of HALL voltage in a N-Type germanium bar having an majority carrier concentration $N_D = 10^{17}$ cm^3. Assume B = 0.2 Wb/m^2, d = 2 mm, E = 10 V/cm. **(05 Marks)**

c. Explain the effect of temperature on semiconductor. **(06 Marks)**

OR

4 a. Explain the qualitative description of current flow at P-N junction under equilibrium and biased condition. **(08 Marks)**

b. Explain zener breakdown and avalanche breakdown under reverse biased P-N junction. **(06 Marks)**

c. Discuss the piece-wise linear approximations of junction diode under ideal condition. **(06 Marks)**

Module-3

5 a. Explain the optical generation of carrier in a P-N junction. **(08 Marks)**

b. Discuss the configuration of a solar cell in enlarged view of the planar junction. **(06 Marks)**

c. What is injection-electroluminiscence and what are its applications? **(06 Marks)**

OR

6 a. Explain I-V characteristics of n-p junction as a function of emitter current. **(08 Marks)**

b. Discuss switching operation in common-emitter transistor. **(06 Marks)**

c. Figure Q6 (c) shows the common emitter amplifier circuit. Calculate I_B and I_C assume $\tau_p = 10\,\mu s$, $\tau_t = 0.1\ \mu s$ **(06 Marks)**

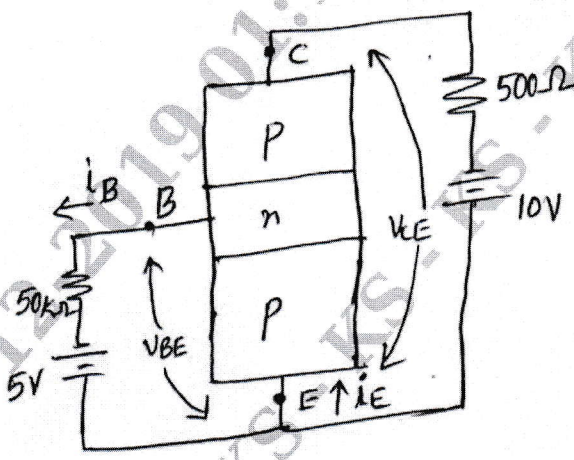

Fig. Q6 (c)

Module-4

7 a. Draw and explain the I-V characteristics of n-channel PNJFET for different biasing voltages. **(07 Marks)**

b. Draw and explain the small signal equivalent circuit of n-channel PNJFET. **(07 Marks)**

c. Explain the MOS structure with the aid of parallel-plate capacitor. **(06 Marks)**

OR

8 a. Explain the effect of frequency on gate voltage of a MOS capacitor with a P-type substrate. **(10 Marks)**

b. Explain P-channel enhancement and depletion type MOSFET with their circuit symbols. **(10 Marks)**

Module-5

9 a. With schematic diagram, explain ION-implantation system. **(07 Marks)**

b. Explain low pressure chemical vapour deposition reactor. **(07 Marks)**

c. Discuss photolithography. **(06 Marks)**

OR

10 a. What are the different types of integrated circuits and its advantages? **(10 Marks)**

b. Explain the process of Integration. **(10 Marks)**

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18EC34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Digital System 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. Design a combinational circuit to output the 2's complement of a 4-bit binary number. **(07 Marks)**

b. Identify all prime implicants and essential prime implicants of following function using K-map:
$f(a, b, c, d) = \sum m + (6, 7, 9, 10, 13) + dc(1, 4, 5, 11, 15)$. Draw the diagram using NAND gates. **(07 Marks)**

c. Expand the following in to canonical form and represent in decimal form:
i) $f_1 = a + bc + ac'd$ in to min-terms
ii) $f_2 = a(b + c)(a + c + d)$ into max terms. **(06 Marks)**

OR

2 a. Find the minimal sum of the following Boolean function using Quine-McClusky method:
$f(a, b, c, d) = \sum m (7, 9, 12, 13, 14, 15) + dc (4, 11)$. **(07 Marks)**

b. Using K-map determine minimal product of sum expressions an implement the simplified equation using only NOR gates:
$f(w, x, y, z) = \pi(1, 2, 3, 4, 9, 10) + d(0, 14, 15)$. **(07 Marks)**

c. Explain briefly K-map, Incompletely specified functions, essential prime implicants and Gray code. **(06 Marks)**

Module-2

3 a. Implement the following using 3 to 8 decoder with active low enable and active HIGH outputs:
i) $f_1(a, b, c, d) = \sum m (0, 1, 5, 6, 7, 9, 10, 15)$
ii) $f_2(a, b, c) = \pi(1, 3, 6, 7)$ **(06 Marks)**

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

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

OR

4 a. Implement $f(a, b, c, d) = \sum(0, 4, 8, 10, 14, 15)$ using
i) 8:1 MUX with a, b, c as select lines
ii) 4:1 MUX with a, b as select lines. **(06 Marks)**

b. Design a two bit magnitude comparator and draw the neat diagram. **(08 Marks)**

c. Explain the structure of programmable logic arrays (PLA) with an example. **(06 Marks)**

Module-3

5 a. Explain clocked SR flip flop using NAND gates with necessary truth table and waveform. **(06 Marks)**

b. Explain with a neat diagram and truth table, a 4-bit SIPO shift register to store binary number 1011. **(07 Marks)**

c. What is race around condition? Explain JK master slave flip flop with a diagram, function table and timing diagram. **(07 Marks)**

OR

6 a. Explain with an excitation table, the conversion of SR flip flop in to JK and D flip flop. **(06 Marks)**

b. Explain the working of 4-bit Twisted Ring counter using necessary diagram and waveform. **(07 Marks)**

c. Explain the working of 3-bit Asynchronous up-down counter with necessary waveform and truth table. **(07 Marks)**

Module-4

7 a. Design a self correcting synchronous counter using positive edge triggered JK flip flop to count 0, 1, 2, 4, 5, 6, 0, 1, 2…. Use the state table and state diagram. **(10 Marks)**

b. Design a clocked sequential circuit which operates according to the state diagram shown in Fig.Q.7(b). Implement the circuit using negative edge triggered JK flip-flop. **(10 Marks)**

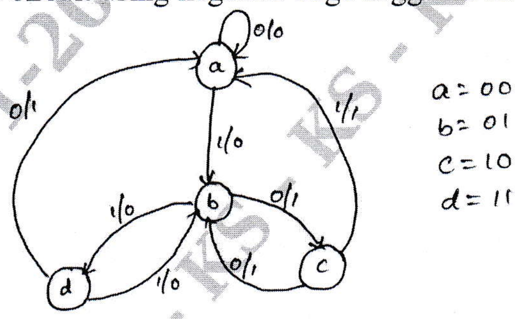

Fig.Q.7(b)

OR

8 a. Construct the excitation table, transition table, state table and state diagram for the sequential circuit shown in Fig.Q.8(a). **(10 Marks)**

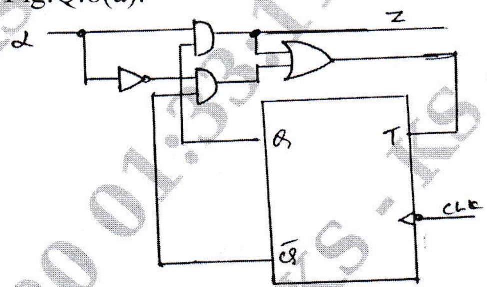

Fig.Q.8(a)

b. Realize synchronous decade counter using T-flip-flop and draw the neat diagram. **(10 Marks)**

Module-5

9 a. Design a Melay type sequence detector to detect the sequence of 101 in the given sequence of 001101100101011. **(10 Marks)**

b. With necessary diagram, explain the concept of serial adder with accumulators. **(10 Marks)**

OR

10 a. Design a sequential circuit to convert BCD to Excess-3 code with state table, state graph and transition table. **(10 Marks)**

b. Explain the design of sequential circuit using CPLDs and give CPLD implementation of a shift register and parallel adder with accumulator. **(10 Marks)**

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18EC35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Computer Organization and Architecture

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. With a neat diagram, explain basic operational concept of computer. **(10 Marks)**
b. Explain in brief different types of key parameters that affect the processor performance. **(05 Marks)**
c. Explain the Bus Structures. **(05 Marks)**

OR

2 a. Illustrate Instruction and Instruction sequencing with an example. **(10 Marks)**
b. Define Byte Addressability, Big-endian and Little-endian assignment. **(06 Marks)**
c. Represent 85.125 in IEEE floating point using single precision. **(04 Marks)**

Module-2

3 a. What is an addressing mode? Explain any five types of addressing modes with example. **(10 Marks)**
b. Write a program to add 'n' number using indirect addressing mode. **(06 Marks)**
c. Explain various assembler directives used in assembly language program. **(04 Marks)**

OR

4 a. Explain stack operation with an example **(10 Marks)**
b. Explain subroutine linkage with an example using linkage register. **(06 Marks)**
c. Explain the shift and rotate operations with example. **(04 Marks)**

Module-3

5 a. Showing the possible register configuration in I/O interface, explain program controlled input/output. **(10 Marks)**
b. What is an interrupt? With an example illustrate the concept of interrupt. **(10 Marks)**

OR

6 a. Explain in detail, the situations where a number of devices capable of initiating interrupts are connected to processor. How to resolve the problems? **(10 Marks)**
b. Explain the registers involved in a DMA interface, to illustrate DMA. **(06 Marks)**
c. Explain the concept of Vectored Interrupt. **(04 Marks)**

Module-4

7 a. With figure, explain Internal Organization of 2M×8 dynamic memory chip. **(10 Marks)**
b. Illustrate Internal structure of static memories. **(10 Marks)**

OR

8 a. With a neat diagram, explain virtual memory organization. **(10 Marks)**
b. Briefly explain any four non-volatile memory concepts. **(05 Marks)**
c. Briefly explain secondary storage devices. **(05 Marks)**

Module-5

9 a. Explain the three-bus organization of the processor and its advantages. **(10 Marks)**

b. Discuss the organization of hardwired control unit. **(05 Marks)**

c. Discuss the control sequence for execution of instruction ADD(R_3), R_1 **(05 Marks)**

OR

10 a. With a block diagram, describe the organization of a micro programmed control unit. **(10 Marks)**

b. Describe the sequence of control signals to be generated to fetch an instruction from memory in a single bus organization. **(10 Marks)**

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18EC36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Power Electronics and Instrumentation

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. Name the power semiconductor devices along their circuit symbols and maximum Ratings. **(04 Marks)**

b. Explain the operation of SCR, interms of two transistor model and derive anode current and gate currents relation. Discuss how a small gate current can trigger the device into condition. **(08 Marks)**

c. The latching current of a thyristor circuit is 60m Amp. The duration of the firing pulse is 50μsec. Given V_s = 100V, R = 20Ω and L = 0.5H are connected in series.
i) Derive the expression for circuit current i(t)
ii) Draw variation of current i(t) with reference to time
iii) Will the thyristor device gets turned ON? **(08 Marks)**

OR

2 a. Enumerate the applications of power electronics. **(04 Marks)**

b. Explain the operation of self commutation by resonating load [class A] with relevant circuit and waveforms. **(08 Marks)**

c. What are the gate triggering schemes? Explain with circuit diagram and wave forms, now RC triggering circuit turns ON (triggers) SCRs. **(08 Marks)**

Module-2

3 a. Explain the control strategies used to operate choppers. **(06 Marks)**

b. Explain with the help of neat circuit diagram and waveforms, the operation of a single phase half wave controlled rectifiers with resistive load. Derive an expression for the :
i) Average load voltage ii) RMS load voltage. **(08 Marks)**

c. For the ideal type A [step down] chopper circuit, following conditions are given : V = 220V, Duty cycle = 0.3, Chopping frequency f = 500Hz, R = 1Ω, L = 3mH and E_b = 23 volts. Determine the following :
i) Minimum value of output current (load)
ii) Maximum value of output current (load)
iii) Average output (load) current. **(06 Marks)**

OR

4 a. Explain the effect of free wheeling diode used in controlled rectifiers. **(04 Marks)**

b. With the circuit diagram and circuit waveforms, explain the principle of operation of step-up chopper. **(08 Marks)**

c. A single phase fully controlled bridge rectifier is feeding to a RL load, to obtain a regulated DC output voltage. The RMS value of the AC voltage is 230V, at 50Hz and the firing angle is maintained at π/3, so that the load current is 4Amp.
i) Calculate the DC average output voltage
ii) Active power and reactive power input
iii) Assuming the load resistance remains the same, determine DC average output voltage. If a freewheeling diode is used at output with all the conditions remains same. **(08 Marks)**

Module-3

5 a. Define the terms : i) instrument ii) Accuracy iii) Absolute error iv) Relative errors? **(04 Marks)**

b. Explain the operation of single – phase half bridge inverter connected to RL load, with the help of circuit and waveforms. **(08 Marks)**

c. A basic D' arsonval movement with a null scale deflection of 2mAmp and having an internal resistance of 50Ω is available. It is to be converted into a 0–10V, 0–1000V, 0–100V and 0–250V multi range voltmeter. Determine the value of resistance to extend? **(08 Marks)**

OR

6 a. What are inverters? Classify the inverters according to commutation and connections? **(04 Marks)**

b. What are the static errors? Explain them in detail with examples. **(08 Marks)**

c. A single phase half bridge inverter, has resistive load of R = 3Ω and DC input voltage V_{dc} = 50 volts. Calculate :

i) RMS output voltage at fundamental frequency
ii) The output power (P_0)
iii) The average and peak current of each thyristor
iv) The peak – reverse blocking voltage of each thyristor. **(08 Marks)**

Module-4

7 a. Explain how a simple AC bridge circuit operates and derive an expression for the unknown parameters. **(04 Marks)**

b. With the aid of diagram, explain the working of unbalanced wheat stone bridge and derive for a galvanometer current expression. **(08 Marks)**

c. Explain the principle of operation of digital time measurement with basic block diagram. **(08 Marks)**

OR

8 a. What are the advantages of digital instruments over analog instruments? **(04 Marks)**

b. Determine the equivalent parallel resistance and capacitance that causes a Wein's bridge to null condition with the following values : R_1 = 3.1KΩ, C_1 = 5.2μF, R_2= 55KΩ, R_4 = 100KΩ, ff = 2.5KHz. Derive the balanced expressions. **(08 Marks)**

c. With neat block diagram, explain the operating principle of a Ramp type DVM. **(08 Marks)**

Module-5

9 a. Define transducers. What are advantages of electrical transducers? **(04 Marks)**

b. Explain instrumentation Amplifier using transducer bridge with the help of circuit diagram. **(08 Marks)**

c. Explain with neat diagram the PLC structure. **(08 Marks)**

OR

10 a. What are features of instrumentation Amplifiers? How it differs from the ordinary opAmp. **(04 Marks)**

b. Describe the operation of resistive position transducer with constructional diagram and typical circuit used. **(08 Marks)**

c. With the aid of Bridge circuit, explain the working of resistance thermometer. Mention limitations of it. **(08 Marks)**

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