CBCS SCHEME

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18MAT31

Third Semester B.E. Degree Examination, Aug./Sept.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.*

Module-1

1 a. Find $L\{e^{-2t} t \cos 2t\}$. **(06 Marks)**

b. Express the function in terms of unit step function and hence find Laplace transform of :

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

c. Solve the equation $y''(t) + 3y'(t) + 2y(t) = 0$ under the condition $y(0) = 1$, $y'(0) = 0$. **(07 Marks)**

OR

2 a. Find :

i) $L^{-1}\left\{\dfrac{s+3}{s^2 - 4s + 13}\right\}$ ii) $L^{-1}\left\{\log\dfrac{(s^2+1)}{s(s+1)}\right\}$. **(06 Marks)**

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

c. A periodic function of period 2a is defined by

$$f(t) = \begin{cases} E & 0 \le t \le a \\ -E & a < t \le 2a \end{cases}$$

Where E is a constant and show that trim $L\{f(t)\} = \dfrac{E}{S} \tan h\left(\dfrac{as}{2}\right)$. **(07 Marks)**

Module-2

3 a. Express $f(x) = x^2$ as a Fourier series in the interval $-\pi < x < \pi$. Hence deduce that $\dfrac{1}{1^2} - \dfrac{1}{2^2} + \dfrac{1}{3^2} - \dfrac{1}{4^2} - - - - = \dfrac{\pi^2}{12}$. **(07 Marks)**

b. Obtain the Fourier seires expression of $f(x) = \begin{cases} \pi x & 0 < x < 1 \\ \pi(2-x) & 1 < x < 2 \end{cases}$. **(07 Marks)**

c. Obtain the half range cosine series for the function $f(x) = (x-1)^2 \; 0 \le x \le 1$. **(06 Marks)**

OR

4 a. Obtain the Fourier series of $f(x)=\left(\frac{\pi-x}{2}\right)$ $0 < x < 2\pi$. Hence deduce that $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}---=\frac{\pi}{4}$. **(07 Marks)**

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

c. Express f(x) as a Fourier series upto first harmonic.

x	0	1	2	3	4	5
f(x)	4	8	15	7	6	2

(06 Marks)

Module-3

5 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. Find the Fourier transform by $f(x) = e^{-|x|}$. **(07 Marks)**

c. Obtain the inverse Z – transform by $u(z) = \frac{z}{(z-2)(z-3)}$. **(06 Marks)**

OR

6 a. Find the Fourier transform by
$$f(x)=\begin{cases} 1-|x| & |x|<1 \\ 0 & |x|>1 \end{cases}$$
and show that $\int_0^\infty \frac{\sin^2 t}{t^2}dt = \frac{\pi}{2}$. **(07 Marks)**

b. Find the z-transform of : i) $\cos n\theta$ ii) $\sin n\theta$. **(06 Marks)**

c. Solve using Z –transform $u_{n+2} - 4u_n = 0$ given that $u_0 = 0$ and $u_1 = 2$. **(07 Marks)**

Module-4

7 a. Using Taylor's series method solve y(x) = x + y, y(0) = 1 then find y at x = 0.1, 0.2 consider upto 4[th] degree. **(07 Marks)**

b. Solve $y'(x) = 1+\frac{y}{z}$, $y(1) = 2$ then find y(1.2) with n = 0.2 using modified Euler's method. **(06 Marks)**

c. Solve $y'(x) = x - y^2$ and the data is y(0) = 0, y(0.2) = 0.02, y(0.4) = 0.0795, y(0.6) = 0.1762 then find y(0.8) by applying Milne's method and applying corrector formula twice. **(07 Marks)**

OR

8 a. Solve $y'(x) = 3x + \frac{y}{2}, y(0) = 1$ then find y(0.2) with n = 0.2 using modified Euler's method. **(06 Marks)**

b. Solve $y(x) = 3e^x + 2y$, $y(0) = 0$ then find y(0.1) with h = 0.1 using Runge-Kutta method of fourth order. **(07 Marks)**

c. Solve $y'(x) = 2e^x - y$ and data is

x	0	0.1	0.2	0.3
y	2	2.010	2.040	2.090

Then find y(0.4) by using Adam's Bash forth method. **(07 Marks)**

Module-5

9 a. By applying Milne's predictor and corrector method to compute y(0.4) give the differential equation $\frac{d^2y}{dx^2} = 1 - \frac{dy}{dx}$ and the following table by initial value. **(07 Marks)**

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

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 extremal of the functional $\int_{x_1}^{x_2} (y' + x^2 y'^2)dx$. **(07 Marks)**

OR

10 a. By Runge Kutta method solve $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$ for x = 0.2 correct to four decimal places. Using initial condition y(0) = 1, y′(0) = 0. **(07 Marks)**

b. Prove that the shortest distance between two points in a plane is a straight line. **(06 Marks)**

c. Find the curve on which the functional $\int_0^1 [y'^2 + 12xy]dx$ with y(0) = 0, y(1) = 1. **(07 Marks)**

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CBCS SCHEME

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18MATDIP31

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Prove that $(1+i)^n + (1-i)^n = 2^{n/2+1}\cos\frac{n\pi}{4}$ **(08 Marks)**

b. Expression the complex number $(2+3i)+\frac{1}{1-i}$ in the form a + ib. **(06 Marks)**

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

OR

2 a. If $\vec{A} = i + 2j - 3k$, $\vec{B} = 3i - j + 2k$ show that $\vec{A}+\vec{B}$ is perpendicular to $\vec{A}-\vec{B}$. Also find the angle between $2\vec{A}+3\vec{B}$ and $\vec{A}+2\vec{B}$. **(08 Marks)**

b. Show that the vectors $i-2j+3k$, $2i+j+k$, $3i+4j-k$ are coplanar. **(06 Marks)**

c. Find the sine of the angle between $\vec{A} = 4i - j + 3k$ and $\vec{B} = -2i + j - 2k$. **(06 Marks)**

Module-2

3 a. Obtain the Maclaurin's series expansion of sin x upto term containing x^4. **(08 Marks)**

b. If $u = \sin^{-1}\left[\frac{x^2+y^2}{x-y}\right]$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$. **(06 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 $\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots\ldots\ldots$ by using Maclaurin's series. **(08 Marks)**

b. If $x = r\cos\theta$, $y = r\sin\theta$ find $\frac{\partial(x,y)}{\partial(r,\theta)}$. **(06 Marks)**

c. If $z = e^{ax+by} f(ax-by)$ then show that $b\frac{\partial z}{\partial x} + a\frac{\partial z}{\partial y} = 2abz$. **(06 Marks)**

Module-3

5 a. Find the angle between the surfaces $x^2+y^2+z^2 = 9$ and $z = x^2+y^2-3$ at the point $(2, -1, 2)$ **(08 Marks)**

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

c. Show that the vector $(-x^2+yz)i + (4y - z^2x)j + (2xz - 4z)k$ is solenoidal. **(06 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.

OR

6 a. A particle moves along the curve $x = t^3 + 1$, $y = t^2$, $z = 2t + 3$ where t is the time. Find the components of its velocity and acceleration at $t = 1$ in the direction $i + j + 3k$. **(08 Marks)**

b. Find the values of a, b, c such that $\vec{F} = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k$ is irrotational. **(06 Marks)**

c. Find $\operatorname{div}\vec{F}$ and $\operatorname{curl}\vec{F}$ where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. **(06 Marks)**

Module-4

7 a. Obtain the reduction formula for $\int_0^{\pi/2} \cos^n x\, dx$, $n > 0$. **(08 Marks)**

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

c. Evaluate $\iint xy(x+y)\,dx\,dy$ over the area between $y = x^2$ and $y = x$. **(06 Marks)**

OR

8 a. Obtain the reduction formula for

$\int_0^{\pi/2} \sin^n x\, dx$, $n > 0$. **(08 Marks)**

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

c. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z}\, dz\, dy\, dx$ **(06 Marks)**

Module-5

9 a. Solve $y(\log y)dx + (x - \log y)dy = 0$ **(08 Marks)**

b. Solve $x.\frac{dy}{dx} + y = x^3 y^6$ **(06 Marks)**

c. Solve $(xy^2 - e^{1/x^3})dx - x^2 y\, dy = 0$ **(06 Marks)**

OR

10 a. Solve $(5x^4 + 3x^2y^2 - 2xy^3)\, dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$ **(08 Marks)**

b. Solve $\frac{dy}{dx} + x\sin 2y = x^3 \cos^2 y$ **(06 Marks)**

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

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CBCS SCHEME

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Third Semester B.E. Degree Examination, Aug./Sept. 2020
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. Using source shifting and source transformation techniques, find the value of V_x for the circuit in Fig.Q1(a).

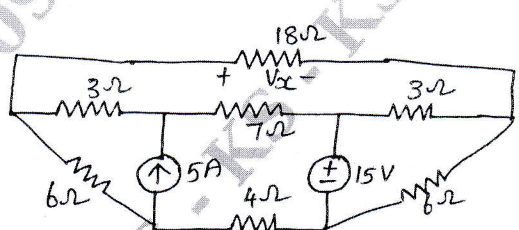


Fig.Q1(a) **(10 Marks)**

b. Use Mesh analysis to the circuit shown in Fig.Q1(b) to find the power supplied by 4V source.

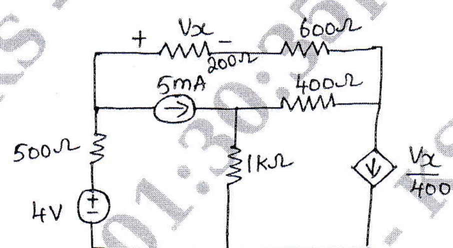


Fig.Q1(b) **(10 Marks)**

OR

2 a. Find the resistance R_{xy} for the circuit shown in Fig.Q2(a) using star–delta transformation.

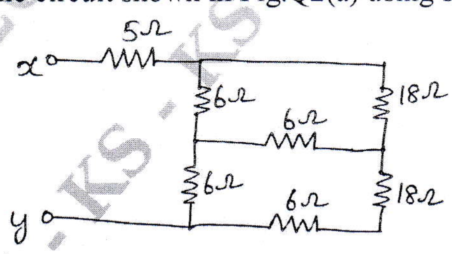


Fig.Q2(a) **(10 Marks)**

b. Find I_1 in the circuit of Fig.Q2(b) using nodal analysis.

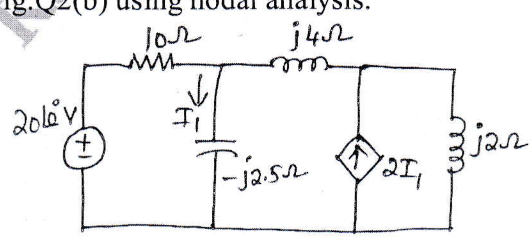


Fig.Q2(b) **(10 Marks)**

Module-2

3 a. Use superposition theorem to find i_0 in the circuit shown in Fig.Q3(a).

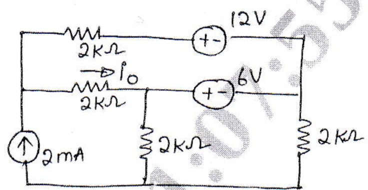


Fig.Q3(a) **(10 Marks)**

b. Find the Thevenin's and Norton's equivalent circuits at the terminals a–b for the circuit in Fig.Q3(b).

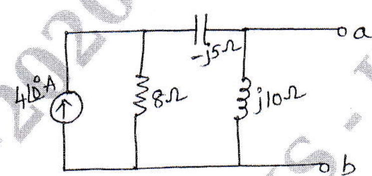


Fig.Q3(b) **(10 Marks)**

OR

4 a. Find the current through $(10 - j3)\Omega$ using Millman's theorem Refer Fig.Q4(a).

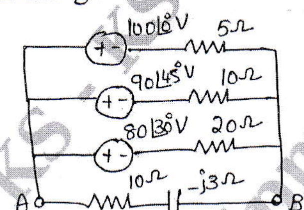


Fig.Q4(a) **(10 Marks)**

b. Find the value of R_L for the network shown in Fig.Q4(b) that results in maximum power transfer. Also find the value of maximum power.

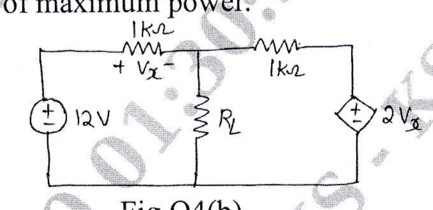


Fig.Q4(b) **(10 Marks)**

Module-3

5 a. For the circuit shown in Fig.Q5(a), the switch K is changed from position 1 to position 2 at t = 0. Steady–state condition having been reached at position 1. Find the values of

$i, \frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$

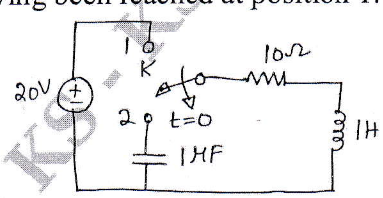
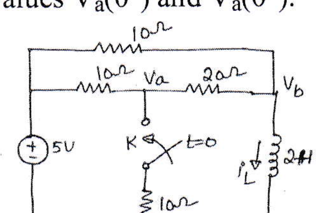


Fig.Q5(a) **(10 Marks)**

b. For the circuit shown in Fig.Q5(b), steady-state is reached with switch K open. At t = 0, the switch is closed. Determine the values $V_a(0^-)$ and $V_a(0^+)$.



OR

6 a. In the network shown in Fig.Q6(a), the switch K is opened at t = 0. Find $v, \frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ at $t = 0^+$.

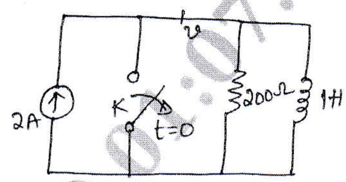


Fig.Q6(a) **(10 Marks)**

b. For the circuit shown in Fig.Q6(b) find :

i) $i(0^+)$ and $v(0^+)$ ii) $\frac{di(0^+)}{dt}$ and $\frac{dv(0^+)}{dt}$ iii) $i(\infty)$ and $v(\infty)$.

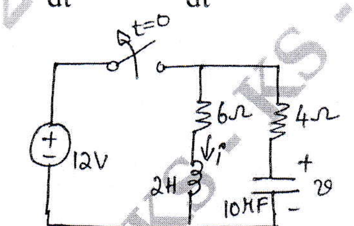


Fig.Q6(b) **(10 Marks)**

Module-4

7 a. State and prove initial–value theorem and final-value theorem. **(10 Marks)**

b. For the circuit of Fig.Q7(b).

i) Write a differential equation for $i_L(t)$ ii) find $I_L(s)$ iii) solve for $i_L(t)$.

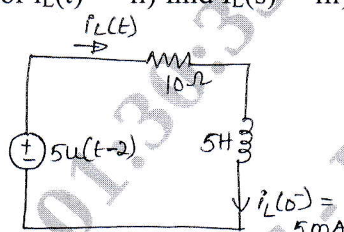


Fig.Q7(b) **(10 Marks)**

OR

8 a. Find the Laplace transform of the periodic signal x(t) shown in Fig.Q8(a).

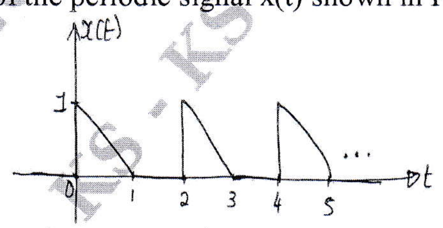


Fig.Q8(a) **(10 Marks)**

b. For the circuit shown in Fig.Q8(b), steady state is reached with the 100V source. At t = 0, switch k is opened. What is the current through the inductor at $t = \frac{1}{2}$ seconds.

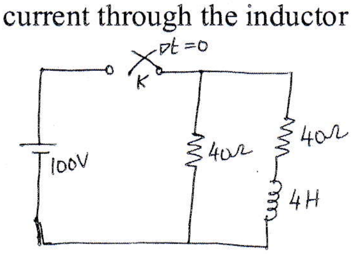


Fig.Q8(b) **(10 Marks)**

Module-5

9 a. Explain h-parameters. Express h-parameters in terms of z-parameters. **(10 Marks)**

b. Find y-parameters for the circuit shown in Fig.9(b).

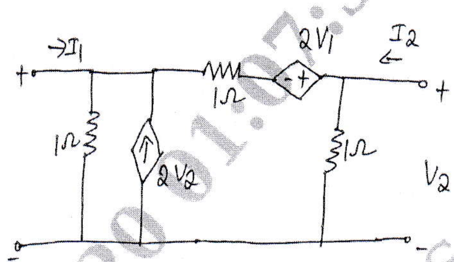


Fig.Q9(b) **(10 Marks)**

OR

10 a. A series RLC circuit has R = 10Ω, L = 0.1H and C = 100μF and is connected across a 200V, variable frequency source, find :

i) Resonant frequency
ii) Impedance at this frequency
iii) Voltage drops across l and c at this frequency
iv) Quality factor
v) Bandwidth. **(07 Marks)**

b. Find the value of R_1 such that the circuit given in Fig.10(b) is resonant.

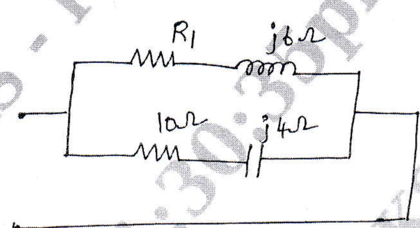


Fig.10(b) **(07 Marks)**

c. A series RLC circuit has R = 10Ω, L = 0.01H and C = 0.01μF and it is connected across 10mV supply. Calculate :

i) f_0 ii) Q_0 iii) Bandwidth iv) f_1 and f_2 v) I_0. **(06 Marks)**

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CBCS SCHEME

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18EC33

Third Semester B.E. Degree Examination, Aug./Sept.2020
Electronic Devices

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain different types of bonding in solids with the help of neat diagram. **(10 Marks)**
b. With a neat diagram explain direct and indirect semiconductor. **(10 Marks)**

OR

2 a. Explain Electron-Hole pair concept with the help of neat diagram and equations. **(10 Marks)**
b. What is Hall-effect? With suitable diagram and equation explain how does Hall-effect works? **(10 Marks)**

Module-2

3 a. What is tunneling? Explain voltage current characteristic of a tunnel diode with the help of energy band diagram. **(10 Marks)**
b. Mention the differences between Zener effect and Avalanche effect. **(03 Marks)**
c. Explain light emitting diode with a neat sketch. **(07 Marks)**

OR

4 a. Explain qualitative description of current flow at forward and reverse bias junction of a diode. **(10 Marks)**
b. How does photodiode works as a photovoltaic cell explain with the help of diagram? **(10 Marks)**

Module-3

5 a. Explain how BJT acts as a amplifier with the help of equation. **(10 Marks)**
b. Draw the Ebers – Moll model for a PNP transistor and explain its significance. **(10 Marks)**

OR

6 a. Explain how BJT acts as a switch with necessary equations and diagram. **(10 Marks)**
b. Explain specification for switching transistor BJT with suitable diagram. **(04 Marks)**
c. Explain the effect of base narrowing with neat diagram. **(06 Marks)**

Module-4

7 a. Explain the construction and operation of n-JFET with neat diagram and equations. **(06 Marks)**
b. Explain small signal equivalent circuit of JFET with neat diagram. **(06 Marks)**
c. Explain the principle of operation n-channel enhancement mode MOSFET with neat diagram and equations. **(08 Marks)**

OR

8 a. Explain two-terminal MOS structure using energy band diagram. **(10 Marks)**
b. Explain the principle of operation of p-channel enhancement mode MOSFET with neat diagram and equations. **(10 Marks)**

Module-5

9 a. Explain thermal oxidation process with neat diagram. **(10 Marks)**

b. What is metallization process explain with neat diagram by showing all the steps in the fabrication of p-n junctions. **(10 Marks)**

OR

10 a. Explain integration of other circuit elements with suitable diagrams. **(10 Marks)**

b. Explain CMOS process of integration with the help of neat diagram. **(10 Marks)**

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CBCS SCHEME

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18EC34

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Place the following equations into proper canonical forms:
i) $f(abc) = a\bar{b} + a\bar{c} + bc$
ii) $f(abcd) = (a+\bar{b})(a+\bar{b}+d)$ **(06 Marks)**

b. Identify all the prime implicants and essential prime implicants of the Boolean function using K-map.
$f(abcd) = \Sigma(0, 1, 2, 5, 6, 7, 8, 9, 10, 13, 14, 15)$ **(06 Marks)**

c. Find the minimal sum and minimal product for the function using K-map.
$f(abcd) = \Sigma(6, 7, 9, 10, 13) + \Sigma d(1, 4, 5, 11, 15)$ **(08 Marks)**

OR

2 a. Represent the number of days in a month for a non-leap year by a truth table, indicating the output of invalid input if any by '0'. **(05 Marks)**

b. Find all the prime implicants of the function using Quine-McClusky method.
$f(abcd) = \Sigma(7, 9, 12, 13, 14, 15) + d(4, 11)$ **(10 Marks)**

c. Simplify the given Boolean equation using K-map:
$f(abcd) = \pi(1, 2, 3, 4, 9, 10) + \pi d(0, 14, 15)$ **(05 Marks)**

Module-2

3 a. Implement full subtractor using 74138 decoder. **(06 Marks)**

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

c. Implement Boolean function using 8:1 MUX treat a, b, c as select lines:
$f(abcd) = \Sigma(0, 1, 5, 6, 7, 9, 10, 15)$ **(06 Marks)**

OR

4 a. Implement the Boolean function $f(abcd) = \Sigma(0, 2, 4, 5, 7, 9, 10, 14)$ using multiplexers with two 4:1 MUX with variable a, d connected to their select lines in the first level and one 2:1 MUX with variable 'C' connected to its select lines in the second level. **(10 Marks)**

b. Implement Boolean function $f(abcd) = \Sigma(4, 5, 7, 8, 10, 12, 15)$ using 4:1 MUX and external gates:
(i) a, b are connected to select line a_1 a_0 respectively
(ii) c, d are connected to select lines a_1 a_0 respectively. **(10 Marks)**

Module-3

5 a. Explain the operation of switch debouncer using SR latch with the help of circuit and waveforms. **(07 Marks)**

b. Explain Master Slave JK F/F with the help of circuit diagram and waveforms. **(07 Marks)**

c. Design a 4-bit binary ripple-up counter using negative edge triggered JK flip-flop. **(06 Marks)**

OR

6 a. Explain positive edge triggered D-flip-flop with the help of circuit diagram and waveforms. (08 Marks)

b. Design a 4-bit universal shift register using positive edge triggered D-flip-flop and multiplexers to operate as indicated below:

Mode select	Operation
00	Hold
01	Right shift
10	Left shift
11	Parallel load

(08 Marks)

c. Write the difference between ripple counter and synchronous counter. (04 Marks)

Module-4

7 a. Design 3 bit synchronous up-counter using J-K flip-flop. (10 Marks)

b. Design a mod-6 synchronous counter using D-flip flop for the sequence 0-2-3-6-5-1. (10 Marks)

OR

8 a. Draw and explain block diagram of Moore model and mealy model. (06 Marks)

b. Design a synchronous circuit using positive edge triggered J-K flip-flop with minimal combinational gating to generate the sequence:
0 – 1 – 2 – 0 if input x = 0
0 – 2 – 1 – 0 if input x = 1
Provide an output which goes high to indicate the non-zero state in the sequence 0 – 1 – 2 – 0. (08 Marks)

c. Design mod-5 synchronous counter using TF/F. (06 Marks)

Module-5

9 a. A sequential circuit has one input (x) and one output (z) the circuit examines groups of four consecutive inputs and produces an output z = 1 if the input sequence 0101 or 1001 occurs. The circuit resets after every four inputs. Find the mealy state graph typical sequence is 0101 0010 1001 0100. (10 Marks)

b. Explain with block diagram design and serial Adder with accumulator. (10 Marks)

OR

10 a. Write a short note on 4 × 4 bit binary parallel multiplication. (10 Marks)

b. List the guide lines for construction of state graphs. (10 Marks)

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CBCS SCHEME

USN | | | | | | | | | | **18EC35**

Third Semester B.E. Degree Examination, Aug./Sept.2020
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 computer with neat block diagram. (10 Marks)
b. Explain computer basic performance equation. (04 Marks)
c. Explain following with an example : i) Three – address instruction ii) Two – address instruction iii) One – address instruction. (06 Marks)

OR

2 a. Explain Single –BUS structure in computer. (06 Marks)
b. Explain system software functions in computer. (06 Marks)
c. What is Operating system? Explain user program and OS routine sharing the processor. (08 Marks)

Module-2

3 a. Explain Big–Endian and Little–Endian with neat diagram. (08 Marks)
b. Explain memory operations with examples. (04 Marks)
c. Explain condition codes with examples. (08 Marks

OR

4 a. Discuss following addressing modes with example : i) Immediate ii) Register iii) Direct iv) Indirect v) Index. (10 Marks)
b. What are assembler directive? Explain any five assembler directives. (10 Marks)

Module-3

5 a. With a neat diagram, explain how to interface printer to the processor. (10 Marks)
b. Define Interrupt. Point out and explain the various ways of enabling and disabling interrupts. (10 Marks)

OR

6 a. Explain the following method of handling interrupts from multiple devices. i) Daisy chain method ii) Priority structure. (10 Marks)
b. Explain operation of DMA with neat diagram. (10 Marks)

Module-4

7 a. Explain internal organization of 16 × 8 memory chip. (10 Marks)
b. Discuss a single–transistor dynamic memory cell. (06 Marks)
c. Write a note on Virtual Memory. (04 Marks)

OR

8 a. Draw and explain the internal organization of 2M × 8 asyndronous DRAM Chip. (08 Marks)
b. Describe the principles of magnetic disk. (06 Marks)
c. What is mapping? Explain set associative cache mapping techniques. (06 Marks)

Module-5

9 a. Discuss with neat diagram, the single bus organization of data path inside a processor. (10 Marks)
b. What are the action required to execute a complete instruction ADD(R3), R1. (10 Marks)

OR

10 a. Draw and explain multiple bus organization of CPU. (10 Marks)
b. Draw and explain organization of the control unit to allow conditional branching in the

CBCS SCHEME

USN | | | | | | | | | |

18EC36

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Define power electronics. Mention the different power electronic circuits. **(04 Marks)**

b. With the help of the static V-I characteristics, explain the three modes of operation of the SCR. **(10 Marks)**

c. Explain class-B commutation with necessary circuit diagram and waveforms. **(06 Marks)**

OR

2 a. Define commutation. Differentiate between natural and forced commutation. **(06 Marks)**

b. Explain the gate characteristics of the SCR. **(04 Marks)**

c. Explain the working of a UJT fixing circuit for a full wave rectifier using SCR with necessary circuit diagram and waveforms. **(10 Marks)**

Module-2

3 a. Differentiate between uncontrolled and controlled rectifier. **(04 Marks)**

b. Explain the operation of single-phase full converter with resistive load with necessary circuit diagram and waveforms. Derive the expression for the average and rms output voltage. **(10 Marks)**

c. Explain the operation of step-up chopper. **(06 Marks)**

OR

4 a. With necessary circuit diagram and waveforms, explain the working of single phase half wave converter with inductive load. **(10 Marks)**

b. Explain the working of step-down chopper. **(06 Marks)**

c. Explain the effect of freewheeling diode. **(04 Marks)**

Module-3

5 a. Explain the working of single phase full bridge inverter with necessary circuit diagram and waveforms. **(08 Marks)**

b. Define the following terms as applied to an electronic instrument:
i) Accuracy
ii) Precision
iii) Resolution **(06 Marks)**

c. Sketch and explain the operation of a multirange ammeter. **(06 Marks)**

OR

6 a. Explain the working of isolated forward SMPS with necessary circuit diagram. **(08 Marks)**

b. Calculate series connected multiplier resistance with D'Arsonal movement with an internal resistance of 50Ω and full scale deflection current of 2mA when converted into a multirange d.c. voltmeter with ranges from 0-20V, 0-40V, 0-150V and 0-200V. **(08 Marks)**

c. Briefly explain the Gross error and absolute error with an example. **(04 Marks)**

Module-4

7 a. Discuss the operation of dual slope integrating type DVM with the help of block diagram. **(08 Marks)**

b. Explain an unbalanced Wheatstone bridge circuit. Determine the amount of deflection due to unbalance of Wheatstone bridge. **(08 Marks)**

c. An inductance comparison bridge is used to measure inductive impedance at a frequency of 5Hz. The bridge constants at balance are $L_3 = 10mH$, $R_1 = 10K\Omega$, $R_2 = 40K\Omega$, $R_3 = 100K\Omega$. Find the equivalent series circuit of an unknown impedance. **(04 Marks)**

OR

8 a. Explain the working of a digital frequency meter with the help of a block diagram. **(10 Marks)**

b. Explain the operation of the Wein's bridge with a neat circuit diagram. Derive an expression for the frequency. **(07 Marks)**

c. If the three arms of a Wheatstone's bridge have the resistances $R_1 = 2K\Omega$, $R_2 = 10K\Omega$ and $R_3 = 40K\Omega$. Find the unknown resistance. **(03 Marks)**

Module-5

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

b. Mention the advantages and limitations of thermistor. **(04 Marks)**

c. Briefly explain the analog weight scale. **(06 Marks)**

OR

10 a. Explain the structure and operation of programmable logic controller. **(07 Marks)**

b. Explain the operation of resistive position transducer. **(05 Marks)**

c. Derive an expression for the gauge factor of bonded resistance wire strain gauge. **(08 Marks)**

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