CBCS SCHEME

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15MAT41

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Mathematics - IV

Time: 3 hrs. Max. Marks: 80

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Use of Statistical table is allowed.*

Module-1

1 a. Employ Taylor's Series Method to find 'y' at x = 0.2. Given the linear differential equation $\frac{dy}{dx} = 3e^x + 2y$ and y = 0 at x = 0 initially considering the terms upto the third degree. **(05 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 (Take h = 0.1). **(05 Marks)**

c. Apply Adams – Bash fourth method to solve $\frac{dy}{dx} = x^2(1 + y)$, given that y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548 and y(1.3) = 1.979 to evaluate y(1.4). **(06 Marks)**

OR

2 a. Given $\frac{dy}{dx} = x^2 + y$, y(0) = 1. Find correct to four decimal places y(0.1) using modified Euler's method taking h = 0.05. **(06 Marks)**

b. Use Milne's Predictor and Corrector method to compute y at x = 0.4, given $\frac{dy}{dx} = 2e^x - y$ and

x	0	0.1	0.2	0.3
y	2	2.010	2.040	2.090

(05 Marks)

c. Use Fourth order Runge – Kutta method to fond y(1.1), given $\frac{dy}{dx} + y - 2x = 0$, y(1) = 3 with step size h = 0.1. **(05 Marks)**

Module-2

3 a. Given $\frac{d^2y}{dx^2} - x\frac{dy}{dx} - y = 0$ with the initial conditions y(0) = 1, y'(0) = 0. Compute y(0.2) using Runge – Kutta method. **(05 Marks)**

b. Show that $J_{1/2}(1) = \sqrt{\frac{2}{\pi x}}\,\text{Sin}\,x$. **(05 Marks)**

c. Derive Rodrigue's formula $P_n(x) = \frac{1}{2^n n!}\frac{d^n}{dx^n}(x^2 - 1)^n$. **(06 Marks)**

OR

c. Define Random variable. The pdf of a variate X is given by the following table :

X	0	1	2	3	4	5	6
P(X)	K	3K	5K	7K	9K	11K	13K

i) Find K, if this represents a valid probability distribution.

ii) Find $P(x \geq 5)$ and $P(3 < x \leq 6)$. **(06 Marks)**

Module-5

9 a. Coins are tossed 100 times and the following results were obtained. Fit a binomial distribution for the data and test the goodness of fit [$\Psi^2_{0.05} = 9.49$ for 4 d.f]. **(06 Marks)**

Number of heads	0	1	2	3	4
Frequency	5	29	36	25	5

b. Find a Unique fixed Probability vector for the regular stochastic matrix.

$$A = \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{6} & \frac{1}{2} & \frac{1}{3} \\ 0 & \frac{2}{3} & \frac{1}{3} \end{bmatrix}$$

(05 Marks)

c. A group of boys and girls were given an intelligence test. The mean score. S.D score and numbers in each group are as follows :

	Boys	Girls
Mean	74	70
SD	8	10
n	12	10

Is the difference between the means of the two groups significant at 5% level of significance [$t_{.05} = 2.086$ for 20 d,f]. **(05 Marks)**

OR

10 a. A coin was tossed 400 times and the head turned up 216 times. Test the hypothesis that the coin is unbiased at 5% level of significance. **(05 Marks)**

b. The weight of 1500 ball bearings are normally distributed with a mean of 635 gms and S.D of 1.36 gms. If 300 random samples of size 36 are drawn from this populations. Determine the expected mean and S.D of the sampling distribution of means if sampling is done i) With replacement ii) without replacement. **(05 Marks)**

c. Every year, a man trades his car for a new car. If he has a Maruti, he trades it for an Ambassador. If he has an Ambassador, he trades it for a Santro. However, if he has a Santro, he is just as likely to trade it for a new Santro as a trade it for a Maruti or an Ambassador. In 2000 he bought his first car which was a Santro. Find the probability that he has

i) 2002 Santro ii) 2002 Maruti. **(06 Marks)**

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CBCS SCHEME

USN 1KT17EC409 **15EC42**

Fourth Semester B.E. Degree Examination, Jan./Feb.2021
Microprocessors

Time: 3 hrs. Max. Marks: 80

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. Define Microprocessor. With a neat diagram, describe the architecture of 8086. **(08 Marks)**

b. Explain the significance of following pins of 8086:
(i) ALE (ii) MN/$\overline{MX}$ (iii) M/$\overline{I/O}$ (iv) DT/$\overline{R}$. **(04 Marks)**

c. Write an ALP to reverse a data block without using a dummy block. **(04 Marks)**

OR

2 a. The Opcode for MOV instruction is "100010" . Determine Machine Language code for the following instructions:
(i) MOV BL, CL (ii) MOV [S1], DL **(04 Marks)**

b. Explain the following instructions, with examples:
(i) XLAT (ii) LDS (iii) AAM **(06 Marks)**

c. Write an ALP to add two, 16 bit (4 digit) BCD numbers. Ignore the end-around carry. **(06 Marks)**

Module-2

3 a. Write an ALP to convert a 16 bit binary number to BCD. **(06 Marks)**

b. If AX = 1234 H, Trace the output in AX after the execution of following instructions :
(i) SHL AX, 1 (ii) ROR AX, 1. **(04 Marks)**

c. Explain any three string instructions of 8086. **(06 Marks)**

OR

4 a. Write an ALP to find number of 1's and 0's in a given 16 bit number. **(06 Marks)**

b. What are assembler directives? Explain the following assembler directives with an example:
(i) DW (ii) OFFSET. **(06 Marks)**

c. Explain any four Flag Manipulation Instructions of 8086. **(04 Marks)**

Module-3

5 a. Explain the stack structure of 8086. **(06 Marks)**

b. Explain the Interrupt cycle of 8086. **(04 Marks)**

c. Write an ALP to find factorial of a 8 bit binary number. **(06 Marks)**

OR

6 a. Explain passing parameters to procedures with an example program. **(06 Marks)**

b. Explain MACROS in 8086, with an example. **(04 Marks)**

c. Write a program to generate a delay of 10 minutes using 8086 microprocessor operating on 10 MHz frequency. Show delay calculation in detail. **(06 Marks)**

CBCS SCHEME

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15EC44

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Signals and Systems

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. For the trapezoidal pulse x(t) shown in Fig Q1(a), find the energy of x(t) also energy of signal $y(t) = \frac{d\,x(t)}{dt}$.

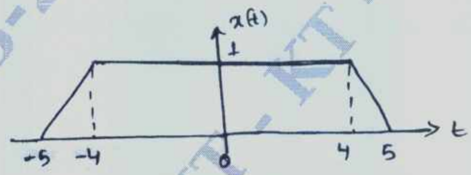

Fig Q1(a) **(04 Marks)**

b. For x(t) and y(t) given in Fig Q1(b) – i) and ii), respectively carefully sketch.
i) $x(t)\,y(-1-t)$ ii) $x(4-t)\cdot y(t)$

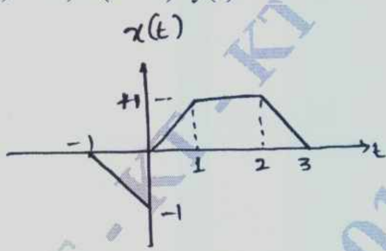

Fig Q1(b) – i)

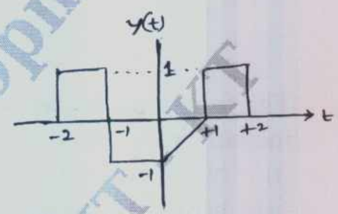

Fig Q1(b) – ii) **(06 Marks)**

c. For the following systems described by the input output relation, determine whether the system is linear, time invariant, causal and stable.
(i) $y(n) = x(n) + u(n+1)$ (ii) $y(t) = e^{-t}\,u(t)$ **(06 Marks)**

OR

2 a. List the elementary continuous time signals with suitable expression and diagram for each. **(06 Marks)**

b. Determine whether the following signals are periodic, if they are periodic, find the fundamental period.

(i) $x(t) = \cos(2\pi t) + \sin(3t)$ (ii) $x(n) = \cos\left(\frac{1}{5}\pi n\right)\cdot \sin\left(\frac{1}{3}\pi n\right)$ **(04 Marks)**

c. Sketch the even and odd components of the signals depicted in Fig Q2(c) i) and ii)

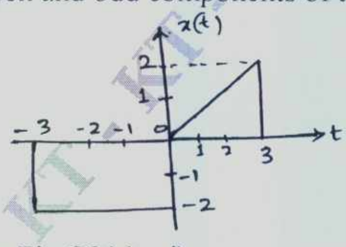

Fig Q2(c) – i)

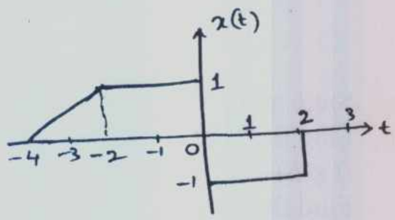

Fig Q2(c) – ii) **(06 Marks)**

OR

8 a. Evaluate the Fourier transform for the signal $x(t) = e^{-3t} u(t-1)$. Sketch the magnitude and phase spectra. **(06 Marks)**

b. Determine the signal x(n) if its DTFT is as shown in Fig Q8(b).

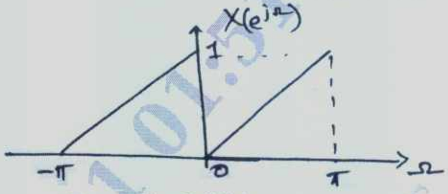

Fig Q8(b) **(05 Marks)**

c. State sampling theorem. Determine the Nyquist rate corresponding to the following signals.
i) $x_1(t) = \cos(150\pi t)\cdot\sin(100\pi t)$ ii) $x_2(t) = \cos^3(200\pi t)$. **(05 Marks)**

Module-5

9 a. State and prove the convolution property of Z transform. **(04 Marks)**

b. Find the Z-transform of the signal

$$x(n) = \left\{ n\left(\frac{-1}{2}\right)^n \cdot u(n) \right\} * \left(\frac{1}{4}\right)^{-n} u(-n)$$ **(06 Marks)**

c. Using power series expansion method, determine the inverse Z-transform of

(i) $X(z) = e^{z^2}$, with ROC all z except $|z| = \infty$

(ii) $X(z) = \dfrac{1}{1+\frac{1}{2}z^{-1}}$ with ROC $|z| > \dfrac{1}{2}$. **(06 Marks)**

OR

10 a. Find the time domain signal corresponding to the Z-transform

$$X(z) = \frac{\frac{1}{4}z^{-1}}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{4}z^{-1}\right)}$$ given the following cases of ROC

i) ROC ; $|z| > \dfrac{1}{2}$ ii) ROC ; $|z| < \dfrac{1}{4}$ iii) ROC $\dfrac{1}{4} < |z| < \dfrac{1}{2}$ **(05 Marks)**

b. A causal system has input x(n) and output y(n). Determine transfer function and impulse response of this system.

$x(n) = (-3)^n \cdot u(n)$ $y(n) = 4(2)^n u(n) - \left(\frac{1}{2}\right)^n u(n)$ **(05 Marks)**

c. A LTI discrete time system is given by the system function $H(z) = \dfrac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$

Specify the ROC of H(z) and determine h(n) for the following conditions.
i) The system is stable ii) The system is causal. **(06 Marks)**

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CBCS SCHEME

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Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Principles of Communication Systems

Time: 3 hrs.   Max. Marks: 80

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. Define Modulation. Explain need for modulation. **(06 Marks)**

b. Derive expression of AM by both time and frequency domain representation with necessary waveforms. **(06 Marks)**

c. A 400W carrier is modulated on a depth of 75%. Calculate the total power in the modulated wave in the following forms of AM.
i) Double sideband suppressed carrier   ii) SSB. **(04 Marks)**

OR

2 a. Explain the generation of DSBSC wave using balanced modulator using diodes with relevant mathematical equations. **(08 Marks)**

b. Explain the generation of SSB wave using phase discrimination method with the help of neat functional block diagram. **(08 Marks)**

Module-2

3 a. Describe angle modulation. **(06 Marks)**

b. Explain the generation of frequency modulated wave using indirect method. **(08 Marks)**

c. The carrier swing of a FM signal 70kHz and the modulating signal is a 7kHz sine wave. Determine the modulation index of FM signal. **(02 Marks)**

OR

4 a. Explain the working of PLL and obtain the modulating signal by using linear model of PLL. **(08 Marks)**

b. Explain the working of a superheterodyne receiver using block diagram. **(08 Marks)**

Module-3

5 a. Describe Mean, Correlation and Covariance functions with respect to stationary random process. **(08 Marks)**

b. Explain the properties of auto correlation function and power spectral density. **(08 Marks)**

OR

6 a. Discuss thermal noise in detail. **(06 Marks)**

b. An amplifier operating over the frequency range from 450 to 460kHz has a 100KΩ input resistor. What is the rms noise voltage at the input to this amplifier if the ambient temperature is 17°C? Also calculate noise power and power spectral density. **(04 Marks)**

c. What is white noise? Plot power spectral density and auto correlation function of white noise. **(06 Marks)**

CBCS SCHEME

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15EC46

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Linear Integrated Circuits

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. State the assumptions made.

Module-1

1 a. Define the following parameters with respect to op-amp.
 i) Input offset current
 ii) Input offset voltage
 iii) CMRR
 iv) PSRR **(08 Marks)**

b. Sketch an illustration to show the effect of op-amp slew rate and explain. **(04 Marks)**

c. If a Non-inverting amplifier is designed for a gain of 50, using op-amp with 90dB CMRR, calculate common mode output (V_{ocm}) for a common mode input (V_{icm}) of 100mV. **(04 Marks)**

OR

2 a. Design a direct-coupled non-inverting amplifier and explain its design steps. **(08 Marks)**

b. Two signals each ranging from 0.1V to 1V are to be summed. Using 741 op-amp design a suitable inverting summing circuit. **(04 Marks)**

c. Design a inverting amplifier using 741 op-amp with voltage gain of 50. The output voltage amplitude is 2.5V. **(04 Marks)**

Module-2

3 a. Draw the circuit to set the upper cut-off frequency using inverting amplifier and explain. **(08 Marks)**

b. A capacitor coupled non-inverting op-amp is to have gain of $A_v = 66$ and $V_i = 15mV$ with $R_L = 2.2K\Omega$ and $f_l = 120Hz$. Design the circuit. **(08 Marks)**

OR

4 a. Explain with a neat circuit design, precision full wave rectifier and also its design steps. **(08 Marks)**

b. Design a precision voltage source, with $V_o = 9V$ and supply voltage is ±12V. Allow 10% tolerance in zener diode [Assume 1N749 with $V_z = 4.3V$]. **(08 Marks)**

Module-3

5 a. Design a precision clipper to clip both ends, using dead zone circuit with relevant waveforms, explain the same. **(08 Marks)**

b. Design capacitor coupled zero-crossing detector with f_l = 1kHz square wave input and $V_{o(p-p)} = 6V$. Use 741 op-amp with ±12V supply [Assume $\Delta V = 1V$, $V_B = 0.1V$] **(08 Marks)**

CBCS SCHEME

USN | | | | | | | | | |

15MATDIP41

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find the rank of the matrix

$$A = \begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$$

by applying elementary row transformations. **(06 Marks)**

b. Solve the system of equations by Gauss-elimination method:

$x + y + z = 6$
$x - y + 2z = 5$
$3x + y + z = 8$ **(05 Marks)**

c. Find all eigen values and eigen vectors of the matrix

$$A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$$ **(05 Marks)**

OR

2 a. Find all eigen values and all eigen vectors of the matrix

$$A = \begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$$ **(06 Marks)**

b. Solve by Gauss elimination method:

$3x + y + 2z = 3$
$2x - 3y - z = -3$
$x + 2y + z = 4$ **(05 Marks)**

c. Find the inverse of the matrix $\begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ using Cayley-Hamilton theorem. **(05 Marks)**

Module-2

3 a. Solve $(D^3 - 6D^2 + 11D - 6)y = 0$ **(06 Marks)**

b. Solve $(D^2 + 6D + 9)y = 2e^{-3x}$ **(05 Marks)**

c. Solve by the method of variation of parameters $(D^2 + 1)y = \tan x$. **(05 Marks)**

OR

4 a. Solve $(D^3 - 5D^2 + 8D - 4)y = 0$ **(06 Marks)**

b. Solve $(D^2 - 4D + 3)y = \cos 2x$ **(05 Marks)**

c. Solve by the method of undetermined coefficients $y'' - y' - 2y = 1 - 2x$. **(05 Marks)**