CBCS SCHEME

USN | | | | | | | | | | 17MAT41

Fourth Semester B.E. Degree Examination, June/July 2019
Engineering Mathematics - IV

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. If $y' + y + 2x = 0$, $y(0) = -1$ then find $y(0.1)$ by using Taylor's series method. Consider upto third order derivative term. **(06 Marks)**

b. Find $y(0.2)$ by using modified Euler's method, given that $y' = x + y$, $y(0) = 1$. Take $h = 0.1$ and carry out two modifications at each step. **(07 Marks)**

c. If $y' = \frac{1}{x+y}$, $y(0) = 2$, $y(0.2) = 2.0933$, $y(0.4) = 2.1755$, $y(0.6) = 2.2493$ then find $y(0.8)$ by Milne's method. **(07 Marks)**

OR

2 a. Use Taylor's series method to find $y(0.1)$ from $y' = 3x + y^2$, $y(0) = 1$. Consider upto fourth derivative term. **(06 Marks)**

b. Use Runge – Kutta method to find $y(0.1)$ from $y' = x^2 + y$, $y(0) = -1$. **(07 Marks)**

c. Use Adam – Bashforth method to find $y(0.4)$ from $y' = \frac{1}{2}xy$, $y(0) = 1$, $y(0.1) = 1.0025$, $y(0.2) = 1.0101$, $y(0.3) = 1.0228$. **(07 Marks)**

Module-2

3 a. Express $x^3 - 5x^2 + 6x + 1$ in terms of Legendre polynomials. **(06 Marks)**

b. Find $y(0.1)$, by using Runge – Kutta method, given that $y'' + xy' + y = 0$, $y(0) = 1$, $y'(0) = 0$. **(07 Marks)**

c. Solve Bessel's operation leading to $J_n(x)$. **(07 Marks)**

OR

4 a. Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$. **(06 Marks)**

b. Find $y(0.4)$ by using Milne's method, given that $y(0) = 1$, $y'(0) = 1$, $y(0.1) = 1.0998$, $y'(0.1) = 0.9946$, $y(0.2) = 1.1987$, $y'(0.2) = 0.9773$, $y(0.3) = 1.2955$, $y'(0.3) = 0.946$. **(07 Marks)**

c. State and prove Rodrigue's formula. **(07 Marks)**

Module-3

5 a. Derive Cauchy – Riemann equations in Cartesian coordinates. **(06 Marks)**

b. Find an analytic function $f(z) = u + iv$ in terms of z, given that $u = e^{2x}(x \cos 2y - y \sin 2y)$. **(07 Marks)**

c. Evaluate $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$, c is $|z| = 3$ by residue theorem. **(07 Marks)**

OR

6 a. Prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. (06 Marks)

b. Discuss the transformation $W = Z^2$. (07 Marks)

c. Find a bilinear transformation that maps the points ∞, i, o in Z – plane into -1, -i, 1 in W – plane respectively. (07 Marks)

Module-4

7 a. In a sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2, out of 1000 such samples, how many would be expected to contain atleast 3 defective parts? (06 Marks)

b. If X is a normal variate with mean 30 and standard deviation 5, find the probabilities that i) $26 \le X \le 40$ ii) $X > 45$ iii) $|X - 30| > 5$.
Given that $\phi(0.8) = 0.288$, $\phi(2.0) = 0.4772$, $\phi(3) = 0.4987$, $\phi(1) = 0.3413$. (07 Marks)

c. The joint density function of two continuous random variables X and Y is given by

$$f(x, y) = \begin{cases} K\ xy, & 0 \le x \le 4,\quad 1 < y < 5 \\ 0, & \text{otherwise} \end{cases}$$

Find i) K ii) E(x) iii) E(2x + 3y). (07 Marks)

OR

8 a. Derive mean and standard deviation of the Poisson distribution. (06 Marks)

b. The joint probability distribution for two random variables X and Y as follows :

X \ Y	-2	-1	4	5
1	0.1	0.2	0	0.3
2	0.2	0.1	0.3	0

Find i) Expectations of X, Y, XY ii) SD of X and Y iii) Covariance of X, Y iv) Correlation of X and Y. (07 Marks)

c. In a certain town the duration of shower has mean 5 minutes. What is the probability that shower will last for i) 10 minutes or more ii) Less than 10 minutes iii) Between 10 and 12 minutes. (07 Marks)

Module-5

9 a. A group of boys and girls were given in Intelligence test. The mean score, SD score and numbers in each group are as follows : (06 Marks)

	Boys	Girls
Mean	74	70
SD	8	10
X	12	10

Is the difference between the means of the two groups significant at 5% level of significance? Given that $t_{0.05} = 2.086$ for 20 d.f.

b. The following table gives the number of accidents that take place in an industry during various days of the week. Test if accidents are uniformly distributed over the week.

Day	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents	14	18	12	11	15	14

Given that $X^2 = 11.09$ at 5% level for 5 d.f. (07 Marks)

c. Find the unique fixed probability vector for the regular stochastic matrix.

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$$ **(07 Marks)**

OR

10 a. Define the following terms :

i) Type I error and type II error.

ii) Transient state.

iii) Absorbing state. **(06 Marks)**

b. A certain stimulus administered to each of the 12 patients resulted in the following increases of blood pressure : 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will be general be accompanied by an increase in blood pressure. Given that $t_{0.05} = 2.2$ for 11 d.f. **(07 Marks)**

c. If $P = \begin{bmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{bmatrix}$. Find the corresponding stationary probability vector. **(07 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | 17EC42

Fourth Semester B.E. Degree Examination, June/July 2019
Signals and Systems

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Determine whether the signal $x(n) = \cos\frac{4\pi n}{6} + \sin\frac{2\pi n}{8}$ is periodic or not. If periodic, find the fundamental period. **(05 Marks)**

b. Let x(t) and y(t) be given in Fig.Q1(b). Sketch the signal $x(2t) * y(\frac{1}{2}t + 1)$. **(08 Marks)**

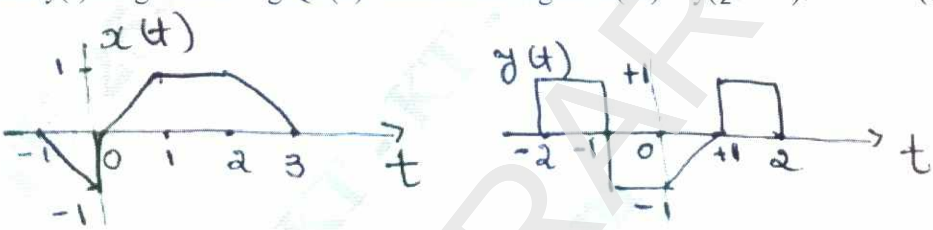

Fig.Q1(b)

c. Express x(t) in terms of g(t). x(t) and g(t) are shown in Fig.Q1(c). **(07 Marks)**

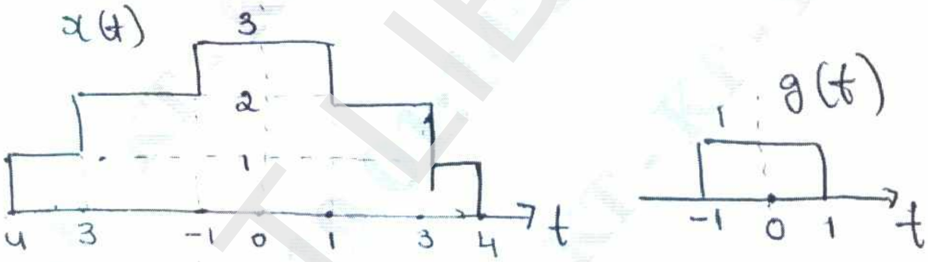

Fig.Q1(c)

OR

2 a. Sketch the waveforms of the signal $x(t) = u(t + 1) - 2u(t) + u(t - 1)$. **(04 Marks)**

b. Determine even and odd component of the signal x(n) shown in Fig.Q2(b). **(06 Marks)**

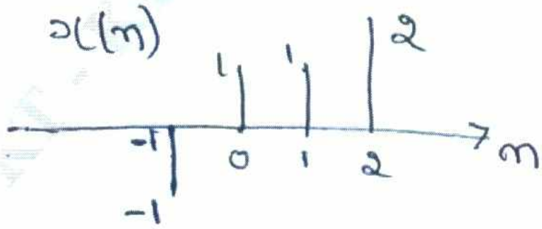

Fig.Q2(b)

c. Find whether the systems $y(t) = x(t/2)$ and $y[n] = e^{x[n]}$ are memoryless, stable, casual, linear and time invariant. **(10 Marks)**

Module-2

3 a. Derive the expression of convolution sum. **(05 Marks)**

b. Compute the response of a discrete LTI system having impulse response $h(n) = [u(n) - u(n-3)]$ and $x(n) = [u(n+1) - u(n-3)]$. **(10 Marks)**

c. State and prove associative property of convolution sum. **(05 Marks)**

OR

4 a. Perform the convolution of $x(t) = e^{-2t}u(t)$ with $h(t) = u(t)$. **(07 Marks)**

b. State and prove distributive property of convolution integral. **(05 Marks)**

c. Find the convolution of the signal $x(n) = \alpha^n u(n)$ with the signal $h(n) = \beta^n u(n)$. Where $|\alpha| < 1$ and $|\beta| < 1$. **(08 Marks)**

Module-3

5 a. Evaluate the step response of LTI systems represented by impulse response $h(t) = e^{-|t|}$. **(05 Marks)**

b. Define Fourier series. State time shift, convolution and Parreval's theorem properties of Fourier series. **(05 Marks)**

c. Evaluate the DTFS of the signal $x(n) = 2\sin\left(\frac{14\pi}{19}n\right) + \cos\left(\frac{10\pi}{19}n\right) + 1$. **(10 Marks)**

OR

6 a. Write the statement of Linearity, freqshift multiplication in time properties of DTFS. **(03 Marks)**

b. Find DTFS of the signal x(n) shown in Fig. Q6(b) and also sketch the magnitude and phase spectrum. **(10 Marks)**

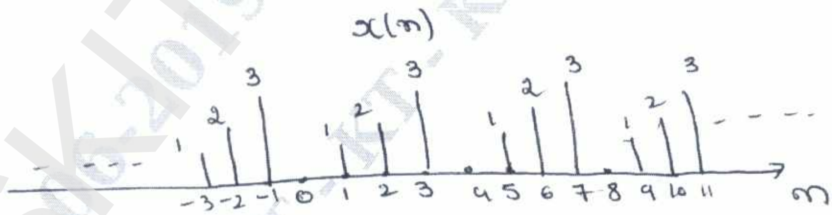

Fig.Q6(b)

c. Compute the Fourier series of the signal x(t) shown in Fig.Q6(C). **(07 Marks)**

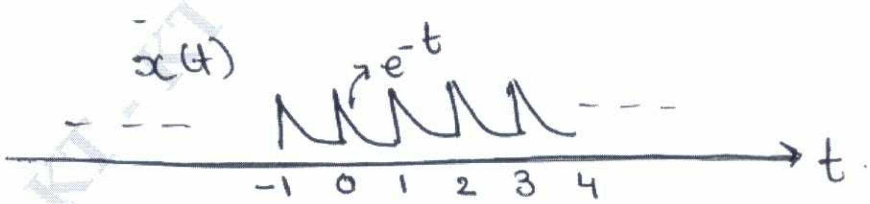

Fig.Q6(c)

Module-4

7 a. Find the Fourier transform of the signal $x(t) = \sin w_c t\ u(t)$. **(07 Marks)**

b. State and prove differentiation in time property of Fourier transform. **(05 Marks)**

c. Evaluate inverse DTFT of the signal $x(e^{j\Omega}) = \dfrac{6}{e^{-j2\Omega} - 5e^{-j\Omega} + 6}$. **(08 Marks)**

OR

8 a. Define sampling theorem. Determine the Nyquist rate and Nyquist interval for the signal $x(t) = \cos\pi t + 3\sin 2\pi t + \sin 4\pi t$. **(06 Marks)**

b. Compute inverse FT of $X(j\omega) = \dfrac{2j\omega + 1}{(j\omega + 2)^2}$. **(06 Marks)**

c. Find DTFT of the signal $x(n) = \left(\dfrac{1}{2}\right)^n u(n) - \left(\dfrac{1}{3}\right)^n u(-n-3)$. **(08 Marks)**

Module-5

9 a. State and prove differentiation in Z-domain property of z-transform. **(05 Marks)**

b. Find the z-transform of the signal $x(n) = n(\tfrac{1}{2})^n u(n)$. **(05 Marks)**

c. Compute inverse Z –transform of the signal $x(z) = \dfrac{\left(\frac{1}{4}\right)z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)}$ for ROC $|z| > \frac{1}{2}$, $\frac{1}{4} < |z| < \frac{1}{2}$. **(10 Marks)**

OR

10 a. Define ROC. Explain the properties of ROC along with example. **(10 Marks)**

b. A discrete LTI system is characterized by the different equation
$y(n) = y(n-1) + y(n-2) + x(n-1)$
Find the system function H(z) and indicate the ROC if the system is stable. Also determine the unit sample response of the stable system. **(10 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | **17EC43**

Fourth Semester B.E. Degree Examination, June/July 2019
Control Systems

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define control system. Compare open loop and closed loop control system. **(06 Marks)**

b. Find the transfer function $\frac{I(s)}{Ui(s)}$ for the circuit shown in Fig.Q.1(b) and K is the gain of an ideal amplifier. **(06 Marks)**

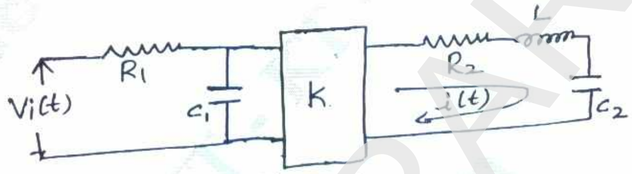

Fig.Q.1(b)

c. The system block diagram is shown in Fig.Q.1(c). Find $\frac{C(s)}{N(s)}$ if R(s) = 0 using block diagram reduction technique. **(08 Marks)**

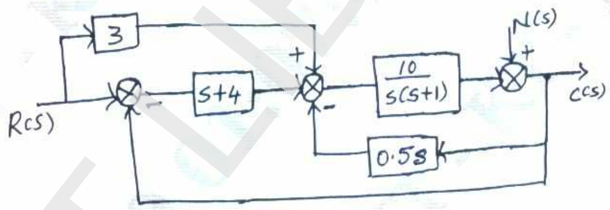

Fig.Q.1(c)

OR

2 a. Define signal flow graph and list the properties of signal flow graph. **(06 Marks)**

b. Find $\frac{C(s)}{R(s)}$ for the signal flow graph shown in Fig.Q.2(b) using Mason's gain formula. **(06 Marks)**

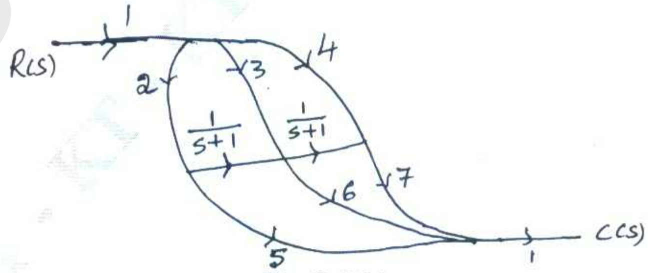

Fig.Q.2(b)

c. For the mechanical system shown in Fig.Q.2(c) i) Draw mechanical network ii) Write differential equations iii) Write the force-to-voltage analogous electric network. **(08 Marks)**

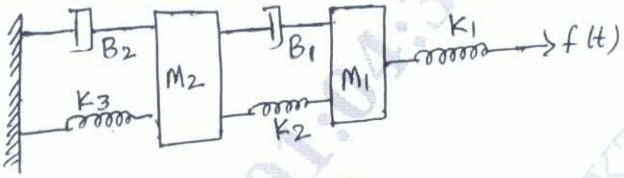

Fig.Q.2(c)

Module-2

3 a. List the standard test input signals used for analysis and evolution of control system. Also write the Laplace transform of corresponding inputs. **(04 Marks)**

b. Find the positional error (k_p), velocity error (k_v) and acceleration error (k_a) coefficients for a unity feed back system with open loop transfer function $G(s)H(s) = \dfrac{K}{s^2(s+20)(s+30)}$. Also find 'K' to limit the steady state error to 5 units due to input $r(t) = 1 + 10t + 20t^2$. **(08 Marks)**

c. A system is given by differential equation $\dfrac{d^2y(t)}{dt^2} + 4\dfrac{dy(t)}{dt} + 8y(t) = 8x(t)$, where y(t) = output and x(t) = input, obtain the output response to step input. For the same calculate: Peak time, Rise time and Peak overshoot. **(08 Marks)**

OR

4 a. Draw the block diagram of PID controller and explain briefly. **(04 Marks)**

b. A unity feedback system has $G(s) = \dfrac{40(s+2)}{s(s+1)(s+4)}$.

Find: i) Type of the system ii) All error coefficients iii) Error for Ramp input with magnitude 4. **(08 Marks)**

c. A system has 30% overshoot and settling time of 5 seconds for an unit step input. Determine: i) The transfer function ii) Peak time (T_P) iii) Output response (Assume C_{ss} as 2%). **(08 Marks)**

Module-3

5 a. A system with characteristics equation $s^6 + 3s^5 + 4s^4 + 6s^3 + 5s^2 + 3s + 2 = 0$. Examine stability using Routh's Hurwitz criterion. **(08 Marks)**

b. Sketch the complete root locus for the system having $G(s)H(s) = \dfrac{K}{s(s^2+8s+17)}$, from the root locus diagram, evaluate the value of K for a system damping factor of 0.5. **(12 Marks)**

OR

6 a. The open loop transfer function of a unity feedback system is $G(s) = \dfrac{K(s+2)}{s(s+3)(s^2+5s+10)}$

i) Find the value of 'K' so that the steady state error for the input r(t) = t u(t) is less than or equal to 0.01.

ii) For the value of K found in part (i) Verify whether the closed loop system is stable or not using R.H criterion. **(08 Marks)**

b. A feedback control system has open loop transfer function $G(s)H(s) = \dfrac{K}{s(s+3)(s^2+3s+2)}$.

Sketch the complete root locus and comment on stability. **(12 Marks)**

Module-4

7 a. For a closed loop control system $G(s) = \frac{100}{s(s+8)}$ $H(s) = 1$. Determine the resonant peak and resonant frequency. **(04 Marks)**

b. Draw the polar plot whose open loop transfer function is $G(s)H(s) = \frac{1}{1+0.1s}$. **(06 Marks)**

c. Using Nyquist stability criterion, investigate the closed loop stability whose open loop transfer function is given by $G(s)H(s) = \frac{100}{(s+1)(s+2)(s+3)}$. **(10 Marks)**

OR

8 a. Explain lead-lag compensator. **(04 Marks)**

b. Explain Nyquist stability criterion. **(06 Marks)**

c. Sketch the Bode plot for a unity feed back system $G(s) = \frac{K}{s(s+2)(s+10)}$. Determine marginal value of 'K' for which system will be marginally stable. Using bode plot. **(10 Marks)**

Module-5

9 a. Explain spectrum analysis of sampling process. **(06 Marks)**

b. State the properties of state transition matrix. **(06 Marks)**

c. Consider the system having state model

$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ -2 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ and $y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ with D = 0. Determine the transfer function of the system. **(08 Marks)**

OR

10 a. Obtain the state model of the electrical system shown in Fig.Q.10(a). **(06 Marks)**

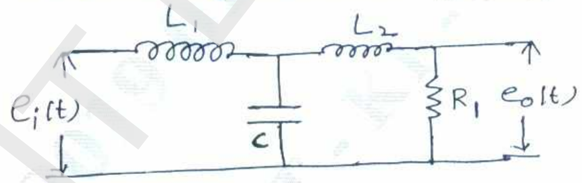

Fig.Q.10(a)

b. Obtain the state model for the system represented by the differential equation

$$\frac{d^3y(t)}{dt^3} + \frac{6d^2y(t)}{dt^2} + 11\frac{dy(t)}{dt} + 10y(t) = 3u(t)$$ **(06 Marks)**

c. Find the state transition matrix for $A = \begin{bmatrix} 0 & -1 \\ 2 & -3 \end{bmatrix}$. **(08 Marks)**

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17EC44

Fourth Semester B.E. Degree Examination, June/July 2019
Principles of Communication

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Illustrate the time domain and frequency domain characteristics of standard Amplitude modulation produced by a single tone. **(08 Marks)**

b. A carried wave 4 sin $(2\pi \times 500 \times 10^3\ t)$ volts is amplitude modulated by an audio wave 0.2 sin 3 $[(2\pi \times 500t) + 0.1 \sin 5\ (2\pi \times 500t)]$ volts. Determine the upper and lower side band and sketch the complete spectrum of the modulated wave. Estimate the total power in the sideband. **(08 Marks)**

c. Discuss coherent detection of DSBSC modulated waves. **(04 Marks)**

OR

2 a. Discuss the concept of Frequency Translation process with the help of block diagram and spectrum. **(07 Marks)**

b. Explain the system of Quadrature carried multiplexing. **(07 Marks)**

c. Compare the parameters of DSBSC and VSB modulation system. **(06 Marks)**

Module-2

3 a. Explain the generation of FM waves by using VCO method. **(08 Marks)**

b. An angle modulated signal is defined by $S(t) = 10 \cos [2\pi \times 106\ t + 0.2 \sin (2000\pi t)]$. Find the following : i) Power in the modulated signal ii) Frequency deviation iii) Phase deviation iv) Approximate transmission bandwidth. **(06 Marks)**

c. Mention the merits and demerits of F.M. **(06 Marks)**

OR

4 a. Illustrate the detection of FM using non – linear model of PLL. **(10 Marks)**

b. With a block diagram approach, explain the operation of FM stereo system. **(10 Marks)**

Module-3

5 a. Explain conditional probability of 2 events. **(05 Marks)**

b. The pdf of a random variable is given as $f_X(x) = \begin{cases} K & \text{for } a \le x \le b \\ 0 & \text{otherwise} \end{cases}$. **(05 Marks)**

where K = constant i) Sketch the pdf and determine the value of 'K'.

c. Determine the Noise equivalent Bandwidth of low pass filter. **(10 Marks)**

OR

6 a. A mixed stage has a noise figure of 20dB. It is preceded by an amplifier which has a noise figure of 9dB and an available power gain of 35 dB. Calculate the overall noise figure referred to the input. **(06 Marks)**

b. Let 'X' be a continuum random variable having a uniform probability distribution defined in the range $2 \le x \le 4$. Let $Y = (3x + 2)$. Find the mean m_x and m_y. **(06 Marks)**

c. Discuss the properties of auto – correlation function. **(08 Marks)**

Module-4

7 a. Derive the figure of merit of AM Receivers. **(10 Marks)**

b. Explain about pre – emphasis and de – emphasis in FM system. **(10 Marks)**

OR

8 a. Show that the figure of merit of FM is $\frac{3}{2}\beta^2$. **(14 Marks)**

b. An AM receiver operating with a sinusoidal modulating signal has the following specifications. $M = 0.8$ $\varepsilon[SNR]_0 = 30dB$. What is the corresponding signal to noise ratio. **(06 Marks)**

Module-5

9 a. Explain the concept with block diagram of TDM system. **(06 Marks)**

b. A TV signal with a bandwidth of 4.2 MHz is transmitted using binary PCM. The number of quantization levels is 512. Calculate i) Code word length ii) Transmission B.W iii) Final bit rate. **(06 Marks)**

c. With neat diagram, explain the generation and detection of PCM signals. **(08 Marks)**

OR

10 a. A PCM system uses a uniform quantizer followed by a 'V' bit encoder. Show that rms signal to quantization noise is approximately given by (1.8 + 6V) dB. **(06 Marks)**

b. Mention the merits , demerits and applications of PAM. **(06 Marks)**

c. A signal $m(t) = 10\cos(20\pi t)\cos(200\pi t)$ is sampled at the rate of 250 samplers/sec.

i) Sketch the spectrum of the sampled signal.

ii) Specify the cutoff for the ideal reconstruction filter.

iii) Specify the Nyquist rate for the signal m(t). **(08 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | 17EC45

Fourth Semester B.E. Degree Examination, June/July 2019
Linear Integrated Circuits

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With a neat circuit diagram, explain basic op-amp circuit. **(08 Marks)**

b. Define the following terms with respect to op-amp and mention its value for 741 op-amp:
(i) CMRR (ii) Slew rate (iii) PSRR **(06 Marks)**

c. Two signals each range from 0.1V to 1V are to be summed and amplified by a factor 5 using LF353 BIFET op-amp design a suitable summing circuit. **(06 Marks)**

OR

2 a. With a neat circuit diagram, explain the working of direct coupled non inverting amplifier. **(08 Marks)**

b. Explain the working of difference amplifier using op-amp. Also obtain the condition for common mode nulling and output level shifting. **(08 Marks)**

c. A LM308 op-amp with a closed loop gain of 33 has a common mode input of 1.5V. Calculate the maximum output voltage produced. The CMRR for LM308 op-amp is 80 dB. **(04 Marks)**

Module-2

3 a. With a neat circuit diagram, explain the working High Z_{in} capacitor coupled voltage follower. Compare its input impedance with capacitor coupled voltage follower. **(08 Marks)**

b. Design a capacitor coupled inverting amplifier using 741 op-amp with input signal 30 mV and a load resistance of 2.2 KΩ is to have $A_V = 150$ and frequency $f_1 = 80$ Hz. **(06 Marks)**

c. Design a high impedance capacitor coupled non-inverting amplifier using 741 op-amp to have a gain of 100 and $f_1 = 120$ Hz. The input signal is 40 mV and the load resistance varies from 1.8 KΩ to 20 KΩ. **(06 Marks)**

OR

4 a. Sketch the circuit of 3 op-amp instrumentation amplifier and show that $V_0 = \frac{R_2}{R_1}\left[1+\frac{2R_F}{R_G}\right][V_2 - V_1]$. Also list the requirements for instrumentation amplifier. **(12 Marks)**

b. Explain the operation of precision full wave rectifier using half wave rectifier and summing circuit. **(08 Marks)**

Module-3

5 a. With a neat circuit diagram and waveforms, explain the working inverting Schmitt trigger. Also draw its transfer characteristics. **(08 Marks)**

b. Design a RC phase shift oscillator to have an output frequency of 5 kHz. Use 741 op-amp with ±12V supply. **(06 Marks)**

c. Explain a Peak detector circuit using op-amp. **(06 Marks)**

OR

6 a. Draw the circuit of sample and hold circuit and explain the operation with necessary waveforms. **(08 Marks)**

b. Explain the working of Logarithmic amplifier using op-amp. **(06 Marks)**

c. Design the capacitor coupled zero crossing detector using 741 op-amp having $I_{B\,max}$ = 500 nA and minimum signal frequency is 500 Hz. The supply voltages are ±12V. **(06 Marks)**

Module-4

7 a. Explain the working of first order active high pass filter using op-amp. Draw its frequency response. **(06 Marks)**

b. Design a second order low pass filter using 741 op-amp for a cut off frequency 1 kHz. **(06 Marks)**

c. Explain the working a single stage first order active band pass filter using op-amp. Draw its frequency response. **(08 Marks)**

OR

8 a. Explain the various performance parameters for IC regulators. **(06 Marks)**

b. Draw the functional block diagram 723 regulator and explain its operation. **(08 Marks)**

c. With a neat circuit diagram; explain the working of current limiting circuit (short circuit protection) in a 723 regulator. **(06 Marks)**

Module-5

9 a. Explain the working of Phase Locked Loop (PLL) with a neat block diagram. **(08 Marks)**

b. Explain the working of successive approximation type analog to Digital Converter (ADC). **(07 Marks)**

c. What output voltage produced DAC whose output range is 0 to 10V and whose binary input is (i) 0110 (ii) 10111100? **(05 Marks)**

OR

10 a. With a neat functional block diagram and waveforms, explain the working of astable multivibrator using 555 timer. Derive the expression for output frequency. **(12 Marks)**

b. Explain the working of 3 bit DAC using R-2R Ladder network. **(08 Marks)**

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CBCS SCHEME

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

17EC46

Fourth Semester B.E. Degree Examination, June/July 2019
Microprocessors

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. Why multiplexing technique is used in 8086? Mention its advantages. **(05 Marks)**

b. Explain the internal architecture of Intel 8086 with neat block diagram and explain in brief. **(10 Marks)**

c. Analyze the effective and physical address if :
   i. Disp = 1B57H, DS = 2100H
   ii. DI = 1045H, DS = 2100H
   iii. BP = 8000H, DS = 5000H, SS = 1000H, Disp = 2345H
   iv. BX = 0158H, SI = 1045H, DS = 2100H, SS = 1400H
   v. BP = 0720H, Disp = 1000H, DS = 2000H, SS = 4000H. **(05 Marks)**

OR

2 a. List the need of control word register of Intel 8086. Explain with an example. **(08 Marks)**

b. What is addressing modes? Explain any four addressing modes with an example to each. **(08 Marks)**

c. Interpret the following instructions : i) SUB and CMP ii) AND and TEST. **(04 Marks)**

Module-2

3 a. Identify the operation of the following instructions :
   i) NEG ii) CBW iii) DAA iv) AAD v) SAHF. **(05 Marks)**

b. Write ALP to move 16 bytes of string of data from the offset 0200H to 0300H. **(10 Marks)**

c. What are assembler directions? Explain the following assembler directions.
   i) Model ii) Assume iii) DB iv) DUP v) END. **(05 Marks)**

OR

4 a. Tell the functions of the following instructions with an example :
   i) ROL ii) RCR iii) SHL iv) SAR v) ROR. **(10 Marks)**

b. Write ALP o convert 8 digits packed BCD number to 16 digits unpacked BCD number. **(10 Marks)**

Module-3

5 a. Explain the operation of the stack using PUSH and POP instructions. **(05 Marks)**

b. Write ALP to find the factorial of an 8-bit number. **(10 Marks)**

c. Interpret the maskable and non–maskable interrupts of 8086. **(05 Marks)**

OR

6 a. Write ALP to generate a delay of 100ms using an 8086 system that runs on 10MHz frequency. **(10 Marks)**

b. Analyze the interrupt cycle of 8086. **(10 Marks)**

Module-4

7 a. Draw the pin configuration of Intel 8086 and explain the operation of pins in maximum mode of operation. **(10 Marks)**

b. Interface two 4K × 8 EPROM and two 4K × 8 RAM chips with 8086. Show the memory mapping. **(10 Marks)**

OR

8 a. Show the block diagram of Intel 8255 and explain the operation of each unit in detail. **(10 Marks)**

b. Interface 8 seven segment display using 8255 with 8086. Write ALP to display 1, 2, 3, 4, 5, 6, 7, 8 over the 8 seven segment display continuously. **(10 Marks)**

Module-5

9 a. Interface 8 bit ADC 0808 through 8255 to 8086. Write ALP to accept the channel number through key board ($O_0 - 0_7$), convert analog i/p of selected channel to digital o/p and store the result as a digital data. **(10 Marks)**

b. Design a stepper motor controller and write ALP to rotate shaft of 4-phase stepper motor. i) In clockwise 5 rotations ii) In anticlockwise 5 rotations. **(10 Marks)**

OR

10 a. Interpret the following INT 214 dos function. I) function 09H ii) function 4CH. **(08 Marks)**

b. Write ALP to generate a square waveform using DAC 0800 through 8255 to 8086. **(12 Marks)**

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CBCS SCHEME

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

17MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2019
Additional Mathematics – II

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 rank of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ -1 & 2 & 3 \\ 1 & 5 & 7 \end{bmatrix}$ by elementary row operations. **(08 Marks)**

b. Test for consistency and solve $x+y+z=6$, $x-y+2z=5$, $3x+y+z=8$. **(06 Marks)**

c. Solve the system of equations by Gauss elimination method :
$x+y+z=9$ $\quad x-2y+3z=8$ $\quad 2x+y-z=3$ **(06 Marks)**

OR

2 a. Find all the eigen values and the corresponding eigen vectors of the matrix
$A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ **(08 Marks)**

b. Solve by Gauss elimination method $x_1-2x_2+3x_3=2$, $3x_1-x_2+4x_3=4$, $2x_1+x_2-2x_3=5$. **(06 Marks)**

c. If $A=\begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ find A^{-1} by Cayley Hamilton theorem. **(06 Marks)**

Module-2

3 a. Solve $\frac{d^3y}{dx^2}-2\frac{d^2y}{dx^2}+4\frac{dy}{dx}-8y=0$. **(08 Marks)**

b. Solve $6\frac{d^2y}{dx^2}+17\frac{dy}{dx}+12y=e^{-x}$. **(06 Marks)**

c. Solve $y''-4y'+13y=\cos 2x$. **(06 Marks)**

OR

4 a. Solve $\frac{d^3y}{dx^3}+6\frac{d^2y}{dx^2}+11\frac{dy}{dx}+6y=0$. **(08 Marks)**

b. Solve $y''+2y+y=\frac{e^{\frac{x}{2}}+e^{-\frac{x}{2}}}{2}$. **(06 Marks)**

c. Solve $y''+2y'+y=2x+x^2$. **(06 Marks)**

Module-3

5 a. Find $L[\cosh at]$. **(08 Marks)**

b. Find $L[e^{-2t}\sinh 4t]$ **(06 Marks)**

c. Find $R\{t\sin 2t\}$. **(06 Marks)**

OR

6 a. Show that $\int_0^\infty t^3 e^{-st} \sin t\,dt = 0$. **(08 Marks)**

b. If $f(t) = t^2$, $0 < t < 2$ and $f(t + 2) = f(t)$ for $t > 2$, find $L[f(t)]$. **(06 Marks)**

c. Express $f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$ in terms of unit step function and hence find their Laplace Transforms. **(06 Marks)**

Module-4

7 a. Find the inverse Laplace Transform of $\frac{3}{s^2} + \frac{2e^{-s}}{s^3} - \frac{3e^{-2s}}{s}$. **(08 Marks)**

b. Find $L^{-1}\left[\frac{s^3 + 6s^2 + 12s + 8}{s^6}\right]$. **(06 Marks)**

c. Find the inverse Laplace Transform of $\frac{s+5}{s^2 - 6s + 13}$. **(06 Marks)**

OR

8 a. Solve by using Laplace Transform $\frac{d^2y}{dt^2} + k^2 y = 0$, given that $y(0) = 2$, $y'(0) = 0$. **(08 Marks)**

b. Find inverse Laplace Transform of $\frac{1}{(s+1)(s+2)(s+3)}$. **(06 Marks)**

c. Find $L^{-1}\left[\frac{s+1}{s^2 + 6s + 9}\right]$. **(06 Marks)**

Module-5

9 a. Find the probability that a leap year selected at random will contain 53 Sundays. **(08 Marks)**

b. A six faced die on which the numbers 1 to 6 are marked is thrown. Find the probability of (i) 3 (ii) an odd number coming up. **(06 Marks)**

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

OR

10 a. A problem is given to three students A, B, C whose chances of solving it are $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}$ respectively. Find the probability that the problem is solved. **(08 Marks)**

b. For any three events A, B, C, prove that $P\{(A \cup B)/C\} = P(A/C) + P(B/C) - P\{(A \cap B)/C\}$. **(06 Marks)**

c. Three machines A, B and C produce respectively 60%, 30% and 10% of the total number of items of a factory. The percentages of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine C. **(06 Marks)**

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