USN | | | | | | | | | | MATDIP401

Fourth Semester B.E. Degree Examination, December 2012

Advanced Mathematics – II

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

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.

1 a. Prove that the angle between two lines whose direction cosines are (ℓ_1, m_1, n_1) and (ℓ_2, m_2, n_2) is $\cos\theta = \ell_1\ell_2 + m_1m_2 + n_1n_2$. **(06 Marks)**

b. Find the projection of the line AB on CD where A = (1, 3, 5), B = (6, 4, 3), C = (2, -1, 4) and D = (0, 1, 5). **(07 Marks)**

c. Find the angle between any two diagonals of cube. **(07 Marks)**

2 a. Find the equation of the plane passing through the points (3, 1, 2) and (3, 4, 4) and perpendicular to $5x + y + 4z = 0$. **(06 Marks)**

b. Show that the points (0, -1, 0), (2, 1, -1), (1, 1, 1) and (3, 3, 0) are coplanar. **(07 Marks)**

c. Find the equation of the plane through the points (1, 0, -1), (3, 2, 2) and parallel to the line $\frac{x-1}{1} = \frac{1-y}{2} = \frac{z-2}{3}$. **(07 Marks)**

3 a. Find the value of λ such that the vectors $\lambda i + j + 2k$, $2i - 3j + 4k$ and $i + 2j - k$ are coplanar. **(06 Marks)**

b. If $\vec{a} = 4i + 2j - k$, $\vec{b} = 2i - j$ and $\vec{c} = j - 3k$, find (i) $(\vec{a}\times\vec{b}).(\vec{b}\times\vec{c})$, (ii) $(\vec{a}\times\vec{b})\times(\vec{b}\times\vec{c})$. **(07 Marks)**

c. Find the cosine and sine of the angle between the vectors $2i - j + 3k$ and $i - 2j + 2k$. **(07 Marks)**

4 a. Find the components of velocity and acceleration at t = 2 on the curve, $\vec{r} = (t^2+1)i + (4t-3)j + (2t^2-6t)k$ in the direction of $i + 2j + 2k$. **(06 Marks)**

b. Find the angle between the tangents to the curve $\vec{r} = \left\{t - \frac{t^3}{3}\right\}i + t^2 j + \left\{t + \frac{t^3}{3}\right\}k$ at $t = \pm 3$. **(07 Marks)**

c. Find the directional derivative of $\phi = x^2yz + 4xz^2$ at (1, -2, -1) along $2i - j - 2k$. **(07 Marks)**

5 a. If $\vec{F} = \nabla(xy^3z^2)$, find $\text{div}\,\vec{F}$ and $\text{curl}\,\vec{F}$ at the point (1, -1, 1). **(06 Marks)**

b. Show that $\vec{F} = (y+z)i + (z+x)j + (x+y)k$ is irrotational. Also find a scalar function ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

c. Prove that $\nabla^2(\log r) = \frac{1}{r^2}$ where $\vec{r} = xi + yj + zk$ and $r = |\vec{r}|$. **(07 Marks)**

6 a. Find Laplace transform of $(2t + 3)^2$. **(05 Marks)**

b. Find Laplace transform of $e^{2t}\cos 3t$. **(05 Marks)**

c. Find $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$. **(05 Marks)**

d. Using Laplace transform, evaluate $\int_0^\infty e^{-2t} t \cos t \, dt$. **(05 Marks)**

7 a. Find inverse Laplace transform of $\frac{s}{s^2 + 4s + 13}$. **(06 Marks)**

b. Find $L^{-1}\left\{\frac{1}{(s^2 + 3s + 2)(s + 3)}\right\}$. **(07 Marks)**

c. Find $L^{-1}\left\{\log\left(\frac{s^2 + 1}{s^2 + s}\right)\right\}$. **(07 Marks)**

8 a. Solve the differential equation $y'' + 4y' + 3y = e^{-t}$ with $y(0) = 1$ and $y'(0) = 1$ by using Laplace transforms. **(10 Marks)**

b. Solve by using Laplace transforms $\frac{dx}{dt} - 2y = \cos 2t$, $\frac{dy}{dt} + 2x = \sin 2t$ with $x = 1$, $y = 0$ at $t = 0$. **(10 Marks)**

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USN | | | | | | | | | | | **10MAT41**

Fourth Semester B.E. Degree Examination, December 2012

Engineering Mathematics – IV

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Using the Taylor's series method, solve the initial value problem $\frac{dy}{dx} = x^2y - 1$, $y(0) = 1$ at the point $x = 0.1$ **(06 Marks)**

b. Employ the fourth order Runge-Kutta method to solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$ at the points $x = 0.2$ and $x = 0.4$. Take $h = 0.2$. **(07 Marks)**

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

2 a. Employing the Picard's method, obtain the second order approximate solution of the following problem at $x = 0.2$.

$$\frac{dy}{dx} = x + yz, \quad \frac{dz}{dx} = y + zx, \quad y(0) = 1, \quad z(0) = -1.$$ **(06 Marks)**

b. Using the Runge-Kutta method, find the solution at $x = 0.1$ of the differential equation $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} - 2xy = 1$ under the conditions $y(0) = 1$, $y'(0) = 0$. Take step length $h = 0.1$. **(07 Marks)**

c. Using the Milne's method, obtain an approximate solution at the point $x = 0.4$ of the problem $\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 6y = 0$, $y(0) = 1$, $y'(0) = 0.1$. Given that $y(0.1) = 1.03995$, $y(0.2) = 1.138036$, $y(0.3) = 1.29865$, $y'(0.1) = 0.6955$, $y'(0.2) = 1.258$, $y'(0.3) = 1.873$. **(07 Marks)**

3 a. If $f(z) = u + iv$ is an analytic function, then prove that $\left(\frac{\partial}{\partial x}|f(z)|\right)^2 + \left(\frac{\partial}{\partial y}|f(z)|\right)^2 = |f'(z)|^2$. **(06 Marks)**

b. Find an analytic function whose imaginary part is $v = e^x\{(x^2 - y^2)\cos y - 2xy\sin y\}$. **(07 Marks)**

c. If $f(z) = u(r, \theta) + iv(r, \theta)$ is an analytic function, show that u and v satisfy the equation $\frac{\partial^2\varphi}{\partial r^2} + \frac{1}{r}\frac{\partial\varphi}{\partial r} + \frac{1}{r^2}\frac{\partial^2\varphi}{\partial\theta^2} = 0$. **(07 Marks)**

4 a. Find the bilinear transformation that maps the points 1, i, –1 onto the points i, 0, –i respectively. **(06 Marks)**

b. Discuss the transformation $W = e^z$. **(07 Marks)**

c. Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$, where C is the circle $|z| = 3$. **(07 Marks)**

PART – B

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

b. Obtain the series solution of Bessel's differential equation $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$ in the form $y = AJ_n(x) + BJ_{-n}(x)$. **(07 Marks)**

c. Derive Rodrique's formula $P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n}(x^2 - 1)^n$. **(07 Marks)**

6 a. State the axioms of probability. For any two events A and B, prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. **(06 Marks)**

b. A bag contains 10 white balls and 3 red balls while another bag contains 3 white balls and 5 red balls. Two balls are drawn at ransom from the first bag and put in the second bag and then a ball is drawn at random from the second bag. What is the probability that it is a white ball? **(07 Marks)**

c. In a bolt factory there are four machines A, B, C, D manufacturing respectively 20%, 15%, 25% 40% of the total production. Out of these 5%, 4%, 3% and 2% respectively are defective. A bolt is drawn at random from the production and is found to be defective. Find the probability that it was manufactured by A or D. **(07 Marks)**

7 a. The probability distribution of a finite random variable X is given by the following table:

x_i	-2	-1	0	1	2	3
$p(x_i)$	0.1	k	0.2	2k	0.3	k

Determine the value of k and find the mean, variance and standard deviation. **(06 Marks)**

b. The probability that a pen manufactured by a company will be defective is 0.1. If 12 such pens are selected, find the probability that (i) exactly 2 will be defective, (ii) at least 2 will be defective, (iii) none will be defective. **(07 Marks)**

c. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation, given that A(0.5) = 0.19 and A(1.4) = 0.42, where A(z) is the area under the standard normal curve from 0 to z >0. **(07 Marks)**

8 a. A biased coin is tossed 500 times and head turns up 120 times. Find the 95% confidence limits for the proportion of heads turning up in infinitely many tosses. (Given that $z_c = 1.96$) **(06 Marks)**

b. A certain stimulus administered to each of 12 patients resulted in the following change in blood pressure:

5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4 (in appropriate unit)

Can it be concluded that, on the whole, the stimulus will change the blood pressure. Use $t_{0.05}(11) = 2.201$. **(07 Marks)**

c. A die is thrown 60 times and the frequency distribution for the number appearing on the face x is given by the following table:

x	1	2	3	4	5	6
Frequency	15	6	4	7	11	17

Test the hypothesis that the die is unbiased.

(Given that $\chi^2_{0.05}(5) = 11.07$ and $\chi^2_{0.01}(5) = 15.09$) **(07 Marks)**

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USN | | | | | | | | | | 10ES42

Fourth Semester B.E. Degree Examination, December 2012

Microcontrollers

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

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.

PART – A

1 a. Mention the difference between RISC and CISC processor. **(06 Marks)**

b. Explain function of following pins of 8051:
   i) $\overline{EA}$
   ii) ALE
   iii) $\overline{PSEN}$
   iv) RST **(08 Marks)**

c. Explain the internal memory organization of 8051. **(06 Marks)**

2 a. With necessary examples, explain immediate, bit direct and indexed addressing mode of 8051. **(06 Marks)**

b. Explain the effect of following instructions:
   i) MOVX A, @dptr
   ii) DJNZ R3, next
   iii) DA A
   iv) LJMP label **(08 Marks)**

c. Write a program segment to realize following:
   i) Exchange contents of external data memory 8100 h with contents of internal data memory 40 h.
   ii) Exchange contents of A-register and B-register using stack. **(06 Marks)**

3 a. What do you understand by assembler directives? Explain the following assembler directives:
   i) ORG ii) END iii) EQU **(08 Marks)**

b. Write an ALP to convert a 2-digit BCD number to binary. **(06 Marks)**

c. Write a delay program to generate a delay of 10 ms. Assume a crystal of 11.0592 MHz. Show delay calculation clearly. **(06 Marks)**

4 a. Explain the usage of the port pins of 8051. **(06 Marks)**

b. With necessary interface diagram, write a C program to generate a triangular wave using DAC interface. **(06 Marks)**

c. With necessary interface diagram, write a program to display "VTU2012" on a LCD interface. **(08 Marks)**

PART – B

5 a. Mention the difference between counter mode and timer mode of operation. With necessary format, explain the various bits of TMOD-SFR. **(06 Marks)**

b. Write an 8051 C program to generate a square wave of 2 kHz using timer 1, mode 2. Show the calculations clearly. Assume a crystal frequency of 11.0592 MHz. **(08 Marks)**

c. Explain the interrupts of 8051 clearly mentioning the vector address and priorities. **(06 Marks)**

6 a. Explain the various modes of serial communication operation. **(06 Marks)**

b. Write a program to transmit a message "VTU" serially at a band rate of 9600. Take crystal frequency as 11.0592 MHz. **(08 Marks)**

c. Explain with a neat diagram, the functional block diagram of 8255. **(06 Marks)**

7 a. With necessary block diagram, explain the architecture of MSP 430. **(08 Marks)**

b. Explain clock system of MSP 430. **(08 Marks)**

c. Explain the use of registers P_XDIR and P_XOUT. **(04 Marks)**

8 a. Explain various low power operating modes of MSP 430. **(10 Marks)**

b. Explain the bits of TCON register. Write an 8051 C program to toggle only bit P1.5 continuously every 50 msec. Use timer 1 to generate the delay.
Assume XTAL = 11.0592 MHz. **(10 Marks)**

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USN | | | | | | | | | | | 10ES43

Fourth Semester B.E. Degree Examination, December 2012
Control Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

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.

PART – A

1 a. Compare linear and non-linear control system. **(04 Marks)**

b. For the two port network shown in Fig. Q1 (b), obtain the transfer functions, i) $\frac{V_2(s)}{V_1(s)}$ and ii) $\frac{V_1(s)}{I_1(s)}$ **(08 Marks)**

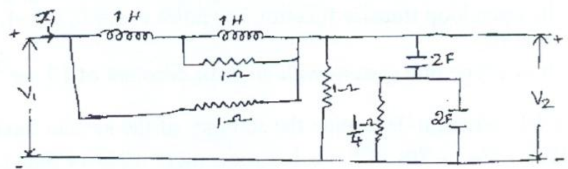

Fig. Q1 (b)

c. For the rotational system shown in Fig. Q1 (c), i) Draw the mechanical network ii) Write the differential equations iii) Obtain torque to voltage analogy. **(08 Marks)**

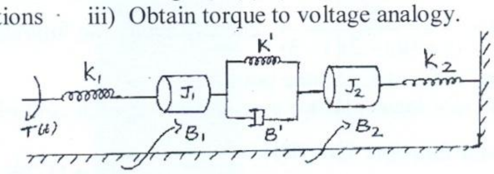

Fig. Q1 (c)

2 a. Illustrate how to perform the following, in connection with block diagram reduction rules:
i) Shifting a take-off point after a summing point.
ii) Shifting a take-off point before a summing point. **(04 Marks)**

b. The performance equations of a controlled system are given by the following set of linear algebraic equations:
i) Draw the block diagram.
ii) Find the overall transfer function $\frac{C(s)}{R(s)}$ using block diagram reduction technique.

$E_1(s) = R(s) - H_3(s)C(s)$; $E_2(s) = E_1(s) - H_1(s)E_4(s)$; $E_3(s) = G_1(s)E_2(s) - H_2(s)C(s)$
$E_4(s) = G_2(s)E_3(s)$; $C(s) = G_3(s)E_4(s)$ **(08 Marks)**

c. Draw the corresponding signal flow graph for the given block diagram is shown in Fig. Q2 (c) and obtain the overall transfer function by Mason's gain formula. **(08 Marks)**

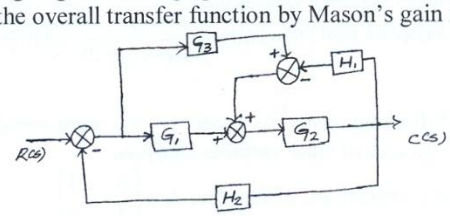

Fig. Q2 (c)

3 a. Derive the expression for peak time. **(04 Marks)**

b. The loop transfer function of a feed back control system is given by,

$$G(s)H(s) = \frac{100}{s^2(s+4)(s+12)}$$

i) Determine the static error co-efficients.

ii) Determine the steady state error for the input $r(t) = 2t^2 + 5t + 10$ **(08 Marks)**

c. A system is given by differential equation, $\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 8y(t) = 8x(t)$.

Where y(t) = output and x(t) = input.

Determine i) peak time ii) peak over shoot iii) settling time

iv) expression of the output response. **(08 Marks)**

4 a. Define the term stability applied to control system and what is the difference between absolute stability and relative stability. **(04 Marks)**

b. Using Routh's criterion determine the stability of following systems:

i) Its open loop transfer function has poles at s = 0, s = -1, s = -3 and zero at s = -5. Gain K = 10.

ii) It is a type one system with an error constant of 10 sec^{-1} and poles at s = -3 and s = -6 **(08 Marks)**

c. Using RH criterion determine the stability of the system having the characteristic equation, $s^4 + 10s^3 + 36s^2 + 70s + 75 = 0$ has roots more negative than s = -2. **(08 Marks)**

PART – B

5 a. The open-loop transfer function of a feed back control system in $G(s)H(s) = \frac{K}{(s+1)(s+2)(s+3)}$, check whether the following points are on the root locus. If so, find the value of K at these points. i) s = -1.5 ii) s = -0.5 + j2 **(06 Marks)**

b. Sketch the root locus plot for a negative feed back control system characterized by an open loop transfer function, $G(s)H(s) = \frac{K}{s(s+3)(s^2+3s+11.2s)}$. Comment on stability. **(14 Marks)**

6 a. State the advantages and limitations of frequency domain approach. **(06 Marks)**

b. Determine the transfer function, of a system whose asymptotic gain plot is shown in Fig. Q6 (b). **(10 Marks)**

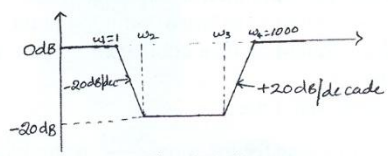

Fig. Q6 (b)

c. List the effects of lead compensation. **(04 Marks)**

7 a. Draw polar plot of $G(s)H(s) = \frac{100}{(s+2)(s+4)(s+8)}$. **(04 Marks)**

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

c. Sketch the Nyquist plot for, $GH(s) = \frac{K}{s(s+1)(s+2)}$. Then, find the range of K for closed loop stability. **(10 Marks)**

8 a. Define the following terms: i) state ii) state variables iii) state space. **(06 Marks)**

b. List the advantages of state variable analysis. **(04 Marks)**

c. Obtain the state transition matrix for, $A = \begin{bmatrix} 0 & -1 \\ 2 & -3 \end{bmatrix}$. **(10 Marks)**

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10EC44

Fourth Semester B.E. Degree Examination, December 2012
Signals and Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Determine whether the following systems are:
i) Memoryless, ii) Stable iii) Causal iv) Linear and v) Time-invariant.
- $y(n) = nx(n)$
- $y(t) = e^{x(t)}$ **(10 Marks)**

b. Distinguish between: i) Deterministic and random signals and
ii) Energy and periodic signals. **(06 Marks)**

c. For any arbitrary signal x(t) which is an even signal, show that $\int_{-\infty}^{\infty} x(t)dt = 2\int_{0}^{+\infty} x(t)dt$. **(04 Marks)**

2 a. Find the convolution integral of x(t) and h(t), and sketch the convolved signal, $x(t) = (t-1)\{u(t-1) - u(t-3)\}$ and $h(t) = [u(t+1) - 2u(t-2)]$. **(12 Marks)**

b. Determine the discrete-time convolution sum of the given sequences.
$x(n) = \{1, \underset{\uparrow}{2}, 3, 4\}$ and $h(n) = \{1, \underset{\uparrow}{5}, 1\}$ **(08 Marks)**

3 a. Determine the condition of the impulse response of the system if system is,
i) Memory less ii) Stable. **(06 Marks)**

b. Find the total response of the system given by,
$$\frac{d^2y(t)}{dt^2} + 3\frac{d}{dt}y(t) + 2y(t) = 2x(t) \text{ with } y(0) = -1;\ \frac{d}{dt}y(t)\Big/_{t=0} = 1 \text{ and } x(t) = \cos(t)u(t).$$
(14 Marks)

4 a. One period of the DTFS coefficients of a signal is given by, $x(k) = (\frac{1}{2})^K$, on $0 \le K \le 9$. Find the time-domain signal x(n) assuming N = 10. **(06 Marks)**

b. Prove the following properties of DTFs: i) Convolution ii) Parseval relationship iii) Duality iv) Symmetry. **(14 Marks)**

PART – B

5 a. Find the DTFT of the sequence $x(n) = \alpha^n u(n)$ and determine magnitude and phase spectrum. **(04 Marks)**

b. Plot the magnitude and phase spectrum of $x(t) = e^{-at}u(t)$. **(08 Marks)**

c. Find the inverse Fourier transform of the spectra, $x(j\omega) = \begin{cases} 2\cos(\omega), & |\omega| < \pi \\ 0, & |\omega| > 0 \end{cases}$ **(08 Marks)**

6 a. Find the frequency response and impulse response of the system described by the differential equation.

$$\frac{d^2}{dt^2}y(t) + 5\frac{d}{dt}y(t) + 6y(t) = -\frac{d}{dt}x(t)$$ **(08 Marks)**

b. State sampling theorem. Explain sampling of continuous time signals with relevant expressions and figures. **(06 Marks)**

c. Find the Nyquist rate for each of the following signals:

i) $x_1(t) = \sin c(200t)$ ii) $x_2(t) = \sin c^2(500t)$ **(06 Marks)**

7 a. Prove the complex conjugation and time-advance properties. **(06 Marks)**

b. Find the z-transform of the signal along with ROC.

$x(n) = n\sin\left(\frac{\pi}{2}n\right)u(n)$ **(06 Marks)**

c. Determine the inverse z-transform of the following x(z) by partial fraction expansion method,

$$x(z) = \frac{z+2}{2z^2 - 7z + 3}$$

if the ROCs are i) $|z| > 3$ ii) $|z| < \frac{1}{2}$ and iii) $\frac{1}{2} < |z| < 3$. **(08 Marks)**

8 a. A system has impulse response $h(n) = \left(\frac{1}{2}\right)^n u(n)$, determine the input to the system if the output is given by,

$$y(n) = \frac{1}{3}u(n) + \frac{2}{3}\left(-\frac{1}{2}\right)^n u(n).$$ **(08 Marks)**

b. Solve the following difference equation using unilateral z-transform,

$y(n) - \frac{3}{2}y(n-1) + \frac{1}{2}y(n-2) = x(n)$, for $n \geq 0$, with initial conditions $y(-1) = 4$, $y(-2) = 10$, and $x(n) = \left(\frac{1}{4}\right)^n u(n)$. **(12 Marks)**

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USN | | | | | | | | | | 10EC45

Fourth Semester B.E. Degree Examination, December 2012
Fundamentals of HDL

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

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.

PART – A

1 a. Write switch level description in VHDL for the inverter circuit with nmos and pmos. Explain the advantages of this type description over the other types. **(08 Marks)**
b. Write the result of all shift and rotate operations in VHDL after applying them to a 7-bit vector A = 1001010 for one position. **(06 Marks)**
c. Explain verilog data types. **(06 Marks)**

2 a. Design 2 × 2 unsigned combinational array multiplier and write the VHDL code for the same. **(08 Marks)**
b. Draw the block diagram of a 3-bit carry-look ahead adder and write data flow description for its Boolean functions in verilog. **(08 Marks)**
c. Explain signal declaration and assignment with examples. **(04 Marks)**

3 a. Write the behavioural description for a half adder using verilog. **(04 Marks)**
b. Write the VHDL description for SR flip-flop using case statement and variable declaration. **(06 Marks)**
c. Explain Booth algorithm with flow chart. Write VHDL description to multiply two 4-bit numbers -5 and 7. **(10 Marks)**

4 a. Write gate level diagram and verilog structural description for D-latch. **(08 Marks)**
b. What is binding? Discuss binding between.
i) Entity and architecture.
ii) Library and component. **(08 Marks)**
c. What are the advantages of HDL structural description? **(04 Marks)**

PART – B

5 a. Write a VHDL function to find the greater of two signed numbers. **(06 Marks)**
b. Write HDL description to convert signed binary to the integer using task. **(08 Marks)**
c. What is the significance of procedure, task and function? Differentiate between them. **(06 Marks)**

6 a. Describe the development of HDL code for an arithmetic logic unit and write the verilog code for 16-bit ALU to perform 8 operations. **(08 Marks)**

b. Write the block diagram and function table of a 3SRAM. Using this write a verilog description for 16 × 8 SRAM. **(08 Marks)**

c. How to attach a package to the VHDL module? Explain with example. **(04 Marks)**

7 a. Write mixed language description of a JK flip-flop with clear, invoking VHDL entity from verilog module. **(08 Marks)**

b. Describe full adder using two half adder invoking verilog module from VHDL entity. **(08 Marks)**

c. Explain the necessity of mixed language description. **(04 Marks)**

8 a. What is synthesis? With a neat flow chart, explain the steps involved in a synthesis process. **(06 Marks)**

b. Design gate level synthesis and write VHDL description for the information given below:

Inputs		Output
a	b	z
00	0 – 7	z = b
01	0 – 7	z = b + 4
10	0 – 7	z = b/2
11	x x	z = 15
x x	8 – 15	z = 15

(14 Marks)

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USN | | | | | | | | | | | **10EC46**

Fourth Semester B.E. Degree Examination, December 2012
Linear ICs and Applications

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Missing data may be assumed.***

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.

PART – A

1 a. Explain the basic circuit of operational amplifier. **(08 Marks)**
b. Define Slew rate and unity gain band width. What is the effect of slew rate on the output voltage of an op-amp? **(06 Marks)**
c. Design an inverting amplifier using op-amp 741. The voltage gain is to be 50 and the output voltage amplitude is to be 2.5V. **(06 Marks)**

2 a. With a neat circuit diagram, explain capacitor coupled voltage follower with relevant design steps. **(10 Marks)**
b. With a neat circuit diagram, explain the design of high input impedance capacitor coupled non-inverting amplifier. **(10 Marks)**

3 a. Explain how stability of high gain amplifier and lower gain amplifier is analyzed. **(06 Marks)**
b. Explain phase-lag compensation and phase lead compensation. **(10 Marks)**
c. Determine the upper cutoff frequency for a (i) voltage follower, (ii) unity gain inverting amplifier using a 741 op-amp. Given that UGB of 741 is 800 kHz. **(04 Marks)**

4 a. With a neat circuit diagram, explain op-amp as precision voltage source. **(10 Marks)**
b. Briefly explain non-saturating precision half wave rectifier. **(05 Marks)**
c. Using Lipolar op-amps with $V_{CC} = \pm 15V$, design the high input impedance precision full wave rectifier. The input peak voltage is to be 1V and no amplification is to occur. **(05 Marks)**

PART – B

5 a. A ±5V, 10 kHz square wave from a signal source with a resistance of 100 Ω is to have its positive peak clamped precisely at ground level. Tilt on the output is not to exceed 1% of the peak amplitude of the wave. Design a suitable op-amp circuit for precision clamping using a supply of ±12V. **(08 Marks)**
b. Briefly explain op-amp square wave/triangular wave generator with relevant circuit diagram, waveforms and expressions. **(08 Marks)**
c. Using a BIFET op-amp with a supply of ±12V, design a Wein bridge oscillator to have an output frequency of 15 kHz. **(04 Marks)**

6 a. With a neat circuit diagram, waveform and expressions explain capacitor coupled non-inverting crossing detector. **(08 Marks)**
b. Explain op-amp inverting Schmitt trigger for adjustable UTP and LTP. **(08 Marks)**
c. Using a 741 op-amp design a first order active low pass filter to have a cut off frequency of 1 kHz. **(04 Marks)**

7 a. With a neat internal diagram of IC723, explain the functions of each block. **(10 Marks)**
b. Explain basic switching regulator circuit with relevant expressions. Mention its advantages and disadvantages. **(10 Marks)**

8 a. Explain 555 timer as monostable multivibrator with relevant circuit diagram, waveforms and expressions. **(07 Marks)**
b. Explain op-amp D/A converter with R and 2R resistors. **(07 Marks)**
c. Draw the block diagram of PLL and explain it. **(06 Marks)**

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