D 13119 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Electronics

ELS 1C 04—ADVANCED DIGITAL SYSTEM DESIGN

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *The instruction if any, to attend a minimum number of questions from each sub section / sub part / sub division may be ignored.*
4. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Part A

Answer any **four** *questions.*
Each question carries weightage 2.

1. Explain Shanon's Expansion theorem.
2. Find the octal designation of the numbers

   (i) 359_{10}. (ii) 166.375_{10}.
3. Explain unateness property of threshold functions.
4. Write a short note on pulse mode sequential circuits.
5. Describe Mealy machine with an example.
6. Differentiate Programmable Array Logic (PAL) and Programmable Logic Array (PLA).
7. Explain different types of FPGA.

(4 × 2 = 8 weightage)

Part B

Answer any **four** *questions.*
Each question carries weightage 3.

8. (a) Simplify the function F = A′B′C′D′ + A′BC′D + A′BCD + ABCD using K-map.

   (b) Explain dynamic hazards in logic circuits.

9. Realize a full adder circuit using AND-OR gates. Then implement it using half adders also.

10. Identify if the function F $(w, x, y, z) = \Sigma$ (0,1,3,5,8,10,11,12,13,15) is symmetric. Express the function in symmetric notation.

11. Explain various steps involved in the design of fundamental mode sequential circuits.

12. Write a short note on essential hazards in sequential circuits.

13. Write a PALASM program to implement 4 bit counter with synchronous clear.

14. Write a short note on Actel ACT2 family.

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*
Each question carries weightage 5.

15. (a) Design a circuit to transform a BCD 4-bit code into a 7-segment display and derive the expression for decoding.

    (b) Explain static hazard free design of logic circuits.

16. (a) Briefly explain various properties of threshold functions.

    (b) Simplify the function $f(a, b, c, d) = \sum_m$ (0, 1, 2, 5, 6, 7, 8, 9, 10, 14) using McClukey method.

17. Realize the given circuits using PAL :

    (i) Binary multiplier.

    (ii) Full adder.

18. Describe Xilinx XC3000 series Input/Output block.

(2 × 5 = 10 weightage)

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FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Electronics

ELS 1C 03—MODERN DIGITAL AND OPTICAL COMMUNICATION

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

General Instructions

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Section A (Short Answer Type)

Answer any **four** *questions.*
Each question carries a weightage of 2.

1. Describe MAN.
2. What is Protocol ?
3. What is data link layer ? Explain its working.
4. What is a multiple access protocol ?
5. Explain the functions of application layer.
6. What is self phase modulation ?
7. Describe WDM.

(4 × 2 = 8 weightage)

Section B (Short Essay Type)

Answer any **four** *questions.*
Each question carries a weightage of 3.

8. What is LAN ? What are it functions ?
9. What is transport layer and network layer responsible for ?
10. What are the different protocols works at each of the layers in OSI Model ?
11. What are the different type of networking / internetworking devices ?
12. What is quantum limit in optical communication ?
13. Explain the Erbium-doped fiber amplifier with its block diagram.
14. What are the types of optical switch ?

(4 × 3 = 12 weightage)

Section C (Long Essay Type)

Answer any **two** *questions.*
Each question carries a weightage of 5.

15. Differentiate between ISO model and TCP/IP model.
16. What is Transmission media ? Explain bounded and unbounded media.
17. Write notes on :
    a) BER Calculation ;
    b) Quatum limit ; and
    c) Power penalities.
18. What is optical amplifier ? Explain the working of Raman amplifier.

(2 × 5 = 10 weightage)

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FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Electronics

ELS 1C 02—MICROCONTROLLER BASED SYSTEM DESIGN

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

General Instructions

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SectionA (Short Answer type)

Answer any **four** *questions.*

Each question carries a weightage of 2.

1. What are tristate devices ? How are they useful in microcontrollers ?
2. Explain how does the status of EA pin affect the access to internal and external program memory.
3. What are interrupts ? List the interrupts in 8051 microcontroller.
4. Write a short note on Timers in 8051 microcontroller.
5. What is a digital to analog converter ?
6. '*void setup* and *void loop* must be included in every Arduino sketch'. Give reasons.
7. Write a short note on Raspberry Pi OS.

(4 × 2 = 8 weightage)

Turn over

Section B (Short Essay Type)

Answer any **four** *questions.*

Each question carries a weightage of 3.

8. Explain the memory organization of 8051 microcontroller.
9. Write a program to get the data from Port 0 and send it to Port 1.
10. What is RS232 standards ? Describe the RS232 handshaking signals.
11. Explain the modes of Timer in 8051 microcontroller.
12. How do you interface a stepper motor with 8051 microcontroller ?
13. What is a sketch ? Explain the different areas in an Arduino GUI IDE ?
14. Explain the GPIO pins in the RaspberryPi board.

(4 × 3 = 12 weightage)

Section C (Long Essay type)

Answer any **two** *questions.*

Each question carries a weightage of 5.

15. Draw and explain the functional block diagram of 8051 microcontroller.
16. Write a program to transmit the data "YES" serially at 9600 baud, 8- bit data, 1 stop bit.
17. Explain the interfacing of a hex keyboard with necessary circuit diagram and algorithm.
18. With the help of a neat diagram explain various parts of a Raspberry Pi.

(2 × 5 = 10 weightage)

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FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Electronics

ELS 1C 01—APPLIED MATHEMATICS

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

General Instructions

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Part A

Answer **four** *questions.*
Each question carries a weightage 2.

1. Find the root of the equation $x^3 - 5x + 1 = 0$ which lies between 2 and 3 using bisection method up to two decimal places in four stages.

2. Given $Y' = \frac{y - x}{y + x}$ with initial condition $y = 1$ at $x = 0$. Find y for $x = 0.1$ by Euler's method.

3. Solve the linear programming problem. Minimize, $4a + 5b + 6c$, subject to the constraints, $a + b \geq 11$, $a - b \leq 5$, $c - a - b = 0$, $7a \geq 35 - 12b$, $a \geq 0$, $b \geq 0$, $c \geq 0$. Show the feasible region in the graph.

4. What are the axioms of probability ? What is the probability of selecting 3 spade cards from a pack of 52 cards ?

5. An urn contains 5 red and 10 black balls. Eight of them are placed in another urn. What is the probability that the latter contains 2 red and 6 black balls ?

6. Find the eigen values of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

7. Consider the matrix $A = \begin{bmatrix} 1 & 1 & 2 & 3 \\ 3 & 4 & -1 & 2 \\ -1 & -2 & 5 & 4 \end{bmatrix}$. What is the rank and nullity of A ?

(4 × 2 = 8 weightage)

Part B

Answer any **four** *questions.*
Each question carries weightage 3.

8. Evaluate $\sqrt{28}$ using Newton Raphson method up to four decimal places.

9. Find the root of the equation $f(x) = x^3 - x - 1$ using Secant method.

10. Apply Runge-Kutta fourth order method to find an approximate value of y when $x = 0.2$ given that $Y' = X + Y$ and $y = 1$ when $x = 0$.

11. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using :

    (i) Trapezoidal rule ;

    (ii) Simpson's 1/3 rule ; and

    (iii) Simpson's 3/8 rule.

12. Four jobs are to be done on four different machines. The cost of producing i^{th} job on the j^{th} machine is given below :

		Machines			
		M_1	M_2	M_3	M_4
Jobs	J_1	15	11	13	15
	J_2	17	12	12	13
	J_3	14	15	10	14
	J_4	16	13	11	17

Assign the jobs to different machines so as to minimize the total cost.

13. (a) State Baye's Theorem.

(b) Consider a test to detect a disease that 0.1 % of the population have. The test is 99 % effective in detecting an infected person. However, the test gives a false positive result in 0.5 % of cases. If a person tests positive for the disease what is the probability that they actually have it?

14. Let $T : R^3 \to R^2$ be a linear transformation such that $T\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} y+z \\ y-z \end{bmatrix}$. Determine the matrix of linear transformation T with respect to ordered basis.

$X = \left\{\begin{pmatrix}1\\0\\0\end{pmatrix}, \begin{pmatrix}0\\1\\0\end{pmatrix}, \begin{pmatrix}0\\0\\1\end{pmatrix}\right\}$ of R^3 and $Y = \left\{\begin{pmatrix}1\\0\end{pmatrix}, \begin{pmatrix}0\\1\end{pmatrix}\right\}$ of R^2.

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*
Each question carries weightage 5.

15. Solve the system of equations using Gauss- Seidel iteration method :

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$
$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$
$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$
$$-x_1 - x_2 - 2x_3 + 10x_4 = -9.$$

16. Using simplex method :

Maximize $Z = 107x_1 + x_2 + 2x_3$

subject to the constraints : $14x_1 + x_2 - 6x_3 + 3x_4 = 7$

$16x_1 + \frac{1}{2}x_2 - 6x_3 \le 5, \qquad 3x_1 - x_2 - x_3 \le 0, \qquad x_1, x_2, x_3, x_4 \ge 0.$

17. (a) Explain Geometric Distribution. What are its properties ?

(b) The lifetime risk of developing a hereditary disease is about one in 78 (1.28 %). Let X is the number of people you ask until one says he or she has the disease. X has a geometric distribution X $G\left(\frac{1}{78}\right)$.

(i) What is the probability that you ask 10 people before one says he or she has the disease ?

(ii) What is the probability that you must ask 20 people ?

(iii) Find the mean and standard deviation of X.

18. (a) Let V be the set of all vectors of the form (x_1, x_2, x_3) in R^3 satisfying :

(i) $x_1 - 3x_2 + 2x_3 = 0$; and

(ii) $3x_1 - 2x_2 + x_3 = 0$ and $4x_1 + 5x_2 = 0$.

(b) State and prove Rank nullity Theorem.

(2 × 5 = 10 weightage)