B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

ENGINEERING MATHEMATICS—III (CMELRPTANSUF)

(2002 admissions onwards—Supplementary)

[Common to all branches]

Time : Three Hours Maximum : 100 Marks

Answer **one** *full question from each module..*
Each full question carries 20 marks.
Use of statistical tables is permitted.

Module 1

1. (a) Solve $x^2 y\,dx = (x^3 - y^3)\,dy$; $y(1) = 1$.

(5 marks)

(b) Solve $y' = \dfrac{2x + 2y - 1}{3x + y - 2}$.

(5 marks)

(c) A tank contains 100 litres of fresh water. 2 litres of brine, each containing 1 gm of dissolved salt, run into the tank per minute, and the mixture kept uniform by stirring uniformly. Water runs out at the rate of 1 litre per minute. Find the amount of salt present when the tank contains 150 litres of brine.

(10 marks)

Or

(d) Solve $y = x + 2\tan^{-1} p$.

(5 marks)

(e) Solve $e^{4x}(p - 1) + e^{2y} p^2 = 0$.

(5 marks)

(f) Calculate the amount of heat passing through 1 cm^2 of a refrigerator wall, if the thickness of the wall is 6 cm and the temperature inside the refrigerator is 0°C while outside it is 20°C. Assume k = 0.0002.

(10 marks)

Module 2

2. (a) Solve $q(p - \cos x) = \cos y$.

(5 marks)

(b) Solve by Charpit's method : $pxy + pq + qy = yz$.

(8 marks)

(c) Solve $\dfrac{\partial^2 z}{\partial x^2} - 2\dfrac{\partial^2 z}{\partial x \partial y} + \dfrac{\partial^2 z}{\partial y^2} = \sin x$.

(7 marks)

Or

Turn over

(d) Find the complete solution of :

$$\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial x \partial y^2} = 4\sin(2x + y).$$

(10 marks)

(e) A tightly stretched string with fixed ends points $x = 0$ and $x = l$ is initially in a position given by $y = y_o \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from its position, find the displacement $y(x, t)$.

(10 marks)

Module 3

2. (a) Find the Fourier Integral representation of the function :

$$f(x) = \begin{cases} c, & x < 0 \\ \frac{1}{2}, & x = 0 \\ e^{-x}, & x > 0 \end{cases}$$

(8 marks)

(b) Find the Fourier sine and cosine transforms of $2e^{-5x} + 5e^{-2x}$.

(12 marks)

Or

(c) Using Parseval's identity show that $\displaystyle\int_0^\infty \frac{x^2 dx}{(1+x^2)^2} = \frac{\pi}{4}$.

(10 marks)

(d) Solve the integral equation $\displaystyle\int_0^\infty f(\theta)\cos\alpha\theta\, d\theta = \begin{cases} 1-\alpha, 0 \le \alpha \le 1 \\ 0, & \alpha > 1 \end{cases}$ Hence evaluate $\displaystyle\int_0^\infty \frac{\sin^2 t}{t^2}\, dt = \frac{\pi}{2}$.

(10 marks)

Module 4

4. (a) The probability that a man aged 70 will live to be 75 is 0.65. What is the probability that out of ten men now 70, at least 7 would live to be 75 ?

(8 marks)

(b) An aptitude test for selecting design Engineers in an IT firm is conducted on 1000 candidates. The average score is 42 and the standard deviation of score is 24. Assuming normal distribution for the scores, find :

(i) The number of candidates whose scores exceed 60.

(ii) The number of candidates whose scores lie between 30 and 60.

(12 marks)

(c) In a certain factory turning razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective, one defective and three defective blades respectively in a consignment of 10,000 packets.

(12 marks)

(d) Find the equation of the best fitting normal curve to the following distribution :

x: 0   1   2   3   4   5

y: 13   23   34   15   11   4

(8 marks)

Module 5

5. (a) In a group of 50 first cousines there were found to be 27 males and 23 females. Ascertain if the observed proportions are inconsistent with the hypothesis that the sexes should be in equal proportion ?

(10 marks)

(b) Fit a binomial distribution to the data :

x: 0   1   2   3   4   5

f: 36   144   340   282   163   25

and test for goodness of fit, at the level of significance 0.05.

(10 marks)

Or

(c) The correlation between height and weight in a sample of 200 ten year old boys is 0.7 and the correlation between height and weight in a sample of 250 ten year old girls is 0.62. Is the difference significant ?

(10 marks)

(d) A research worker wishes to estimate mean of a population by using sufficiently large sample. The probability is 95% that sample will not differ from the true mean by more than 25% of the S.D. How large a sample should be taken ?

(10 marks)

[5 × 20 = 100 marks]

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Reg. No......................................

Name...

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

Branch : Computer Science and Engineering

COMPUTER ORGANIZATION (R)

(2002 Admissions onwards—Supplementary)

Time : Three Hours

Maximum : 100 Marks

Part A

*Answer **all** questions briefly.*
Each question carries 4 marks.

1. With a neat diagram, explain the data path used for fetching instruction and incrementing the program counter.

2. Explain the basic control signals to be generated by a processor for memory and I/O operations.

3. Explain signed multiplication.

4. Describe addition and subtraction done in a computer system with appropriate examples.

5. Explain the memory transfer operation using micro instructions.

6. Describe how a micro instruction is executed in horizontal approach.

7. Differentiate between compulsory miss and capacity miss in memory.

8. Explain with a neat diagram, a 4-way set associative Cache.

9. Explain the working of a mouse.

10. Explain interrupt driven I/O techniques.

(10 × 4 = 40 marks)

Part B

*Answer any **one** full question from each module*
Each question carries 12 marks.

Module 1

11. Describe the various operation cycles involved in the running of a program.

Or

12. What are the different bus structures ? Explain under what circumstances, we may go for multiplexing buses.

Module 2

13. Design an Accumulator circuit that is used to perform the arithmetic and logic operations on datas of 4 bit. Illustrate with one stage of ALU.

Or

Turn over

14. Clearly explain various techniques used by high performance processors to reduce the time needed for multiplication.

Module 3

15. Explain the implementation of microcode controller used for microprogram execution.

Or

16. (a) What are the functions and uses of PLAs ?

    (b) Explain bit-slice microinstruction format and its processor.

Module 4

17. Give the features of Cache memory. What is the role of compiler optimization technique in reducing the Cache misses ?

Or

18. Explain the address translation from virtual address to physical address in a paged segmented memory system. What are the additional address bits required in such a translation ? How does a TLB improves the speed of address translation ?

Module 5

19. Specify the characteristics of (i) parallel bus standard IEEE 488, and (ii) serial communication standard-current loop, RS 232 C, with suitable illustration for each case.

Or

20. Specify the characteristics of an IO processor :

    (a) Its interactions with CPU.

    (b) Sequence of actions for executing an IO program.

    (c) Sequence of actions of CPU initiated IO data transfer.

    (d) Sequence of actions for device initiated IO data transfer.

$(5 \times 12 = 60 \text{ marks})$

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B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

Branch : Computer Science and Engineering

OBJECT ORIENTED PROGRAMMING (R)

(2002 Admissions onwards—Supplementary)

Time : Three Hours   Maximum : 100 Marks

Part A

*Answer **all** questions.*
Each question carries 4 marks.

1. Explain the effect of member functions in a class.

2. What does the concept of a class in object oriented programming convey ? What is the relation of object to classes ?

3. How does inheritance influence the working of constructors and destructors ?

4. What is containership ? How does it differ from inheritance ?

5. Explain the concept and applications of abstract class.

6. What is a friend function ? Discuss the advantages and disadvantages of using a friend function.

7. What is a virtual base class ? What are its uses ?

8. List the properties of constructor functions.

9. What is multithreading ? How does it improve the performance of Java ?

10. What is world wide web ? What is the contribution of Java to the world wide web ?

(10 × 4 = 40 marks)

Part B

*Answer **either** section (a) **or** (b) of each module.*
Each full question carries 12 marks.

Module 1

11. (a) (i) Differentiate between constructors and other member functions of a class.   (7 marks)

    (ii) Explain the use of copy constructor, with an example.   (5 marks)

Or

(b) Write a C++ program that has a class called POINT which stores (*x, y*) coordinates. Define constructors, destructors and overload operator ' + ' to calculate distance between two points.

(12 marks)

Turn over

Module 2

12. (a) (i) Differentiate between public and protected visibility in context of OOP, giving suitable examples for each.

                                                        (8 marks)

         (ii) If a derived class does not add any data members to the base class, does the derived class require constructors ? Explain.

                                                        (4 marks)

Or

    (b) (i) What should be the structure of a class when it has to be a base class for other classes ?

                                                        (6 marks)

         (ii) How does the visibility mode control the access of members in the derived class ? Explain with example.

                                                        (6 marks)

Module 3

13. (a) Write a program to implement an overloaded multiplication operator to return the factorial of an integer.

Or

    (b) Explain virtual functions and their importance with an example program.

Module 4

14. (a) Explain the virtual base classes with appropriate examples. List its merits and applications.

Or

    (b) (i) Define a function template to interchange the value of two data items. Use this function to interchange the values of two integer numbers and two real numbers.

         (ii) What are namespaces ? Illustrate its application with an example.

Module 5

15. (a) Write a program to implement a doubly-linked list using dynamic memory allocation.

Or

    (b) Describe the structure of a simple Java program. Explain the various methods of writing comments in Java.

                                                           (5 × 12 = 60 marks)

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B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

Branch : Computer Science and Engineering

DATA STRUCTURES AND PROGRAMMING METHODOLOGIES (R)

(2002 Admissions onwards —Supplementary)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.
Each question carries 4 marks.

1. Give a recursive algorithm to reverse a character string.

2. Define "time complexity of an algorithm". Why are computer scientists interested in it ?

3. What is a priority queue ? How can it be implemented efficiently ?

4. A circular queue is implemented using an array of size n. Give a formula in terms of *front, rear* and n for the number of elements in the queue. How does the queue become circular ?

5. Compare and contrast arrays with linked lists.

6. Give a function to reverse a singly linked list.

7. Give a recursive function to search a graph in Depth First order.

8. Prove that a binary tree of height h ($h > = 0$) has a least h and at most $2^h - 1$ elements in it.

9. Briefly explain the process of external sorting using merge sort.

10. What is heap ? Explain its properties.

(10 × 4 = 40 marks)

Part B

Answer all questions.
Each question carries 12 marks.

11. Write an algorithm to find the n-th Fibonacci number, and find out its time complexity.

Or

12. Give a recursive version of Binary Search algorithm and derive its worst case time complexity.

13. A list is being maintained as a circular queue, which is implemented using an array of size n.

    (a) Write an algorithm to delete the k-th element in the list.

    (b) Write an algorithm to insert an element immediately after the k-th element in the list.

Or

14. What is a Dqueue ? How do you implement it using array ? Write codes to enqeue and dequeue elements.

Turn over

15. Write code/pseudo-code to implement a queue using circular linked list and explain its working

Or

16. Write a code/pseudo-code for adding two polynomials represented as singly linked lists. Explain its working.

17. Give and explain the working of non-recursive Depth First Search and Breadth First Search algorithms.

Or

18. Write a function/pseudo-code for :

    (a) Counting the number of leaf nodes.

    (b) Swapping the left and right child of each node of a Binary Tree, given the pointer to the root.

19. Give the Heap Sort algorithm. Trace the working with a sample set of 10 numbers and draw all the intermediate heaps formed.

Or

20. Write a program/pseudo-code for Quick Sort. Analyze its performance and time complexity when an input, which is already sorted in descending order, is given.

(5 × 12 = 60 marks)

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B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

Branch : Computer Science and Engineering

ADVANCED MICROPROCESSORS AND PERIPHERALS (R)

(2002 admission onwards—Supplementary)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions briefly.
Each question carries 4 marks.

1. Write the control word for the following configuration of the ports of 8255 for mode 2 operation :

    Port A – bidirectional, Mode of Port A – mode 2

    Port B – input, mode of Port B – mode 0.

2. Explain the handshaking mode of operation.

3. Distinguish between programmed data transfer and interrupt driven data transfer.

4. Explain how will you design a programmable sample rate generator for A/D subsystem ?

5. What is pipelined architecture ? How it is implemented in 8086 ?

6. Mention any four addressing modes in 8086. Give examples for each.

7. Explain the effect of the following instructions of 8086 :—

    (i) AAM.   (ii) LEA Si, X.

    (iii) PUSH F.   (iv) CMP.

8. Explain real and protected modes in 80286.

9. Explain the circuit for generating memory and I/O control signal for 80386.

10. Explain the address space of PENTIUM III.

(10 × 4 = 40 marks)

Part B

Answer any one full question from each module.
Each full question carries 12 marks.

Module 1

11. Explain different methods of data communication and architectural features of 8251.

Or

12. With neat diagrams, explain the various features of 8252. Show how it is interfaced with 8085 ?

Turn over

Module 2

13. Interface an 8-bit ADC with 8085 using memory mapped I/O. Also write an interrupt routine to read the output data of the converter, store it in memory and continue to collect data for the specified "*n*" number of times.

Or

14. Assume that 8255 control register and ports are assigned below as :

CR – 9003 H

PA – 9000 H

PB – 9001 H

PC – 9002 H

Design and draw a system with 8255 port connection to read the status of 8 switches and displays the compliments of that in another 8 LED's. Write the program for the same.

Module 3

15. (a) Explain the maximum mode configuration and timing diagram of 8086 system.

(b) Draw and explain the read cycle timing diagram for minimum mode of 8086.

(8 + 4 = 12 marks)

Or

16. (a) Explain the register organisation of 8086 ?

(b) Explain the memory segmentation of 8086. What are its advantages ?

(6 + 6 = 12 marks)

Module 4

17. (a) Explain the machine language instruction formats followed in 8086.   (6 marks)

(b) Write an Assembly Language Program to find out the largest number from an unordered array of sixteen 8-bit numbers stored sequentially in the memory locations starting at offset 0400H the segment 2000 H.

(6 marks)

Or

18. (a) Write an Assembly language program to reverse the given string of 10 characters stored in the memory DS : 2000 H, store the reverse pattern in DS : 4000 H.

(8 marks)

(b) What do you mean by interrupt priorities ? List out the interrupt priorities in 8086.

(4 marks)

Module 5

19. (a) List and explain different data types supported by 80386 ?   (6 marks)

  (b) Write a note on descriptors and descriptor tables.   (6 marks)

Or

20. With a neat block diagram, explain the PENTIUM CPU architecture and also explain the super scalar organisation.

            (12 marks)

          [5 × 12 = 60 marks]

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B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

Branch : Computer Science and Engineering

INTEGRATED CIRCUITS (R)

(2002 Admissions onwards—Supplementary)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 marks.

1. Sketch and explain a 4-input DTL AND gate.

2. Discuss the risetime and falltime of MOS and CMOS gates.

3. Explain different types of latches and their special features.

4. Realise the following functions using $3 \times 4 \times 2$ PLA :

   $f_1\ (a, b, c) = \Sigma m\ (1, 2, 4, 5)$.

   $f_2\ (a, b, c) = \Sigma m\ (0, 1, 2, 7)$.

5. Explain the advantages of R-2R digital to analog converters.

6. Explain the principle of dual slope analog to digital converter.

7. Explain the significance of CMRR in a differential amplifier. Suggest methods to improve the same.

8. Draw and design a non-inverting amplifier with a gain of 26 dB and an input impedance of 47 kΩ.

9. Sketch the output waveform for the circuit given below, if the input signal is a 5 V peak sine wave
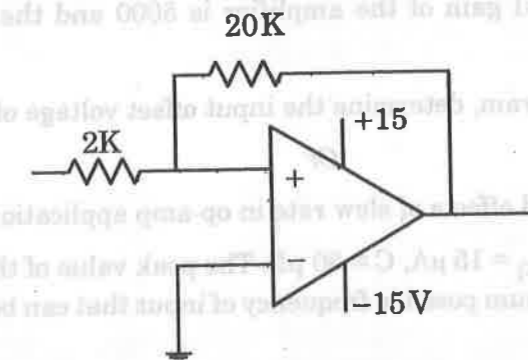
10. Draw the circuit diagram of an op-amp square wave generator to generate square waves at 1 kHz, 10 % duty cycle.

(10 × 4 = 40 marks)

Turn over

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 marks.

Module 1

11. (a) What is tristate buffer ? What are its types ? Explain.

    (b) With a neat circuit, explain the working of NMOS NOR gate.

Or

12. (a) With a neat circuit diagram, explain a 3-input ECL gate. What are its merits and demerits ?

    (b) Describe the current sourcing and current sinking with reference to TTL gate and derive their standard values.

Module 2

13. (a) Design a binary to gray code converter using 4 : 1 MUX.

    (b) What is decoder ? Derive logic diagram for 4 to 10 decoder.

Or

14. (a) What is the principle of PLA ? Explain PLA folding.

    (b) Explain the principle of CD ROM. How data is saved and retrieved ?

Module 3

15. With neat diagrams explain the working of a Successive Approximation type ADC. If the clock frequency of an 8-bit successive approximation type ADC is 3 MHz, calculate its conversion time.

Or

16. With neat circuit diagram, explain the principle of a 4-bit weighted resistor type DAC. What is the percentage resolution of this 4-bit DAC, given that the maximum number that can be represented using 4-bits is 15 ?

Module 4

17. (a) Calculate the output voltage of a differential amplifier for the input voltages of 300 μV and 230 μV. The differential gain of the amplifier is 5000 and the value of CMRR is (i) 10 ; (ii) 1000 ; (iii) 10^6.

    (b) With a neat circuit diagram, determine the input offset voltage of a differential amplifier.

Or

18. (a) What are the causes and effects of slew rate in op-amp applications ?

    (b) For a typical op-amp, $I_{CQ} = 15$ μA, C = 30 pF. The peak value of the input is 12 V. Determine the slew rate and maximum possible frequency of input that can be applied to get undistorted output.

Module 5

19. In a basic triangular/square wave generator using 741, find the component values for the square wave with peak values of ± 5 V, triangular wave with peak values of ± 7 V, for continuously varying from 10 Hz to 10 kHz. Derive the equations used.

Or

20. A five-input summing amplifier has the values of $R_1 = R_2 = R_3 = R_4 = R_5 = 15$ kΩ. What is the value of the feedback resistor required to produce an averaging amplifier ? Draw the circuit and derive the equations used

$(5 \times 12 = 60 \text{ marks})$