USN | | | | | | | | | | **06MAT31**

Third Semester B.E. Degree Examination, December 2010
Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Find the Fourier series for the function $f(x) = x(2\pi - x)$ over the interval $(0, 2\pi)$ and deduce that $\dfrac{\pi^2}{12} = \sum_{n=1}^{\infty} \dfrac{(-1)^{n+1}}{n^2}$. **(07 Marks)**

b. Obtain the half-range sine series for
$$f(x) = \begin{cases} \dfrac{1}{4} - x, & \text{for } 0 < x < \dfrac{1}{2} \\ x - \dfrac{3}{4}, & \text{for } \dfrac{1}{2} < x < 1 \end{cases}.$$ **(07 Marks)**

c. Obtain the constant term and the co-efficients of $\sin\theta$ and $\sin 2\theta$ in the Fourier expansion of y given the following data **(06 Marks)**

$\theta°$	0	60	120	180	240	300	360
y	0	9.2	14.4	17.8	17.3	11.7	0

2 a. Obtain the finite Fourier sine transform of the function $f(x) = \cos kx$, where k is a non integer, over $(0, \pi)$. **(07 Marks)**

b. Find the Fourier sine and cosine transforms of $f(x) = e^{-\alpha x}$, $\alpha > 0$. **(07 Marks)**

c. Find the inverse Fourier transform of e^{-u^2}. **(06 Marks)**

3 a. Form the partial differential equation by eliminating the arbitrary functions from $Z = f(x + It) + g(x - it)$, where $i = \sqrt{-1}$. **(07 Marks)**

b. Solve by the method of separation of variables $p y^3 + q x^3 = 0$. **(07 Marks)**

c. Solve $(mz - ny)p + (nx - lz)q = ly - mx$. **(06 Marks)**

4 a. Derive the one – dimensional heat equation. **(07 Marks)**

b. Obtain the D'Almbert's solution of the wave equation $u_{tt} = c^2 u_{xx}$, subject to the condition $u(x, 0) = f(x)$ and $\dfrac{\partial u}{\partial t}(x,0) = 0$. **(07 Marks)**

c. Solve the wave equation $c^2 \dfrac{\partial^2 u}{\partial x^2} = \dfrac{\partial^2 u}{\partial t^2}$, $0 < x < \pi$, given $u(0, t) = u(\pi, t) = 0$; $u(x, 0) = 0$; $\dfrac{\partial u}{\partial t}(x, 0) = A(\sin x - \sin 2x), A \neq 0$. **(06 Marks)**

PART – B

5 a. Find the smallest and the largest roots of $e^x - 4x = 0$, correct to 4 decimal places by Newton – Raphson method. **(07 Marks)**

b. Solve by Gauss elimination method
$2x_1 + x_2 + 4x_3 = 12$; $4x_1 + 11x_2 - x_3 = 33$; $8x_1 - 3x_2 + 2x_3 = 20$. **(07 Marks)**

c. Find the largest eigenvalue and the corresponding eigenvector of the matrix by using power method :
$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$ taking $[1, 1, 1]^T$ as the initial eigenvector, perform 5 iterations. **(06 Marks)**

6 a. Using the Lagrange' formula, find the interpolating polynomial that approximates to the function described by the following table : **(07 Marks)**

X	0	1	2	3	4
f(x)	3	6	11	18	27

Hence find f(0.5) and f(3.1)

b. A rod is rotating in a plane. The following table gives the angle θ (in radians) through which the rod has turned for various values of t (in seconds)

t	0	0.2	0.4	0.6	0.8	1.0	1.2
θ	0	0.12	0.49	1.12	2.02	3.20	4.67

Calculate the angular velocity and angular acceleration of the rod at $t = 0.4$ second. **(07 Marks)**

c. Evaluate $\int_0^1 \frac{x}{1+x^2}dx$ by using the Simpson's $(3/8)^{th}$ rule, dividing the interval into 3 equal parts. Hence find an approximate value of $\log\sqrt{2}$. **(06 Marks)**

7 a. Derive the Euler's equation in the form $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$. **(07 Marks)**

b. Solve the variational problem :

$\delta \int_0^1 (x + y + y'^2)dx = 0$ under the conditions $y(0) = 1$ and $y(1) = 2$. **(07 Marks)**

c. Find the geodesics on a surface given that the arc length on the surface is

$S = \int_{x_1}^{x_2} \sqrt{x(1+y'^2)}\,dx$. **(06 Marks)**

8 a. Find the Z-transform of

i) $3n - 4\sin\frac{n\pi}{4} - 5a^2$

ii) $\cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)$. **(07 Marks)**

b. Obtain the inverse Z-transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$. **(07 Marks)**

c. Solve the difference equation $u_{n+2} - 5u_{n+1} + 6u_n = 2$, with $u_0 = 3$, $u_1 = 7$ using z-transforms. **(06 Marks)**

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Third Semester B.E. Degree Examination, December 2010
Electronic Circuits

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What is a clipper? Mention the various types of clippers, with examples. With a neat circuit diagram and waveforms, explain the working of a positive clipper. The waveform should be clipped at +3V. Assume that silicon diode is used in the circuit. **(08 Marks)**

b. What is a clamper? Mention the various types of clampers, with examples. With a neat circuit diagram and waveforms, explain the working of a negative clamper. **(08 Marks)**

c. Explain the working of a voltage polarity tester and continuity tester, using LEDs. **(04 Marks)**

2 a. Identify the type of biasing, used in the following circuit shown in Fig.Q2(a). Indicate the method to obtain DC equivalent circuit and write the DC equivalent circuit. Calculate I_{CQ}, I_{BG}, I_{EQ}, V_{CQ}, V_{BQ}, V_{EQ} and r_e' in the circuit. Assume $\beta = 200$. **(08 Marks)**

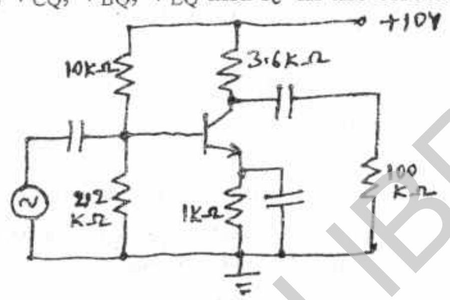


Fig.Q2(a)

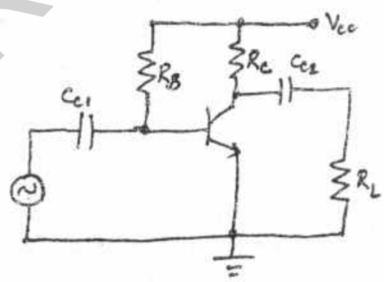


Fig.Q2(b)

b. Explain the two transistor models that are commonly use as the AC equivalent circuit of a transistor. For the circuit shown in Fig.Q2(b), write the AC equivalent circuit, using any one of the transistor models. **(08 Marks)**

c. What is meant by small signal operation of a transistor? Explain its importance. **(04 Marks)**

3 a. What is the value of v_{out} in the circuit shown in Fig.Q3(a). **(07 Marks)**

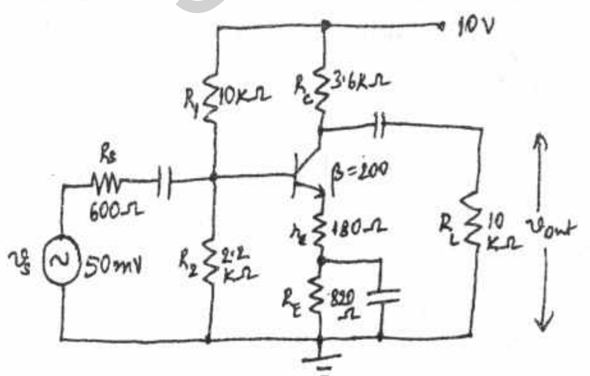


Fig.Q3(a)

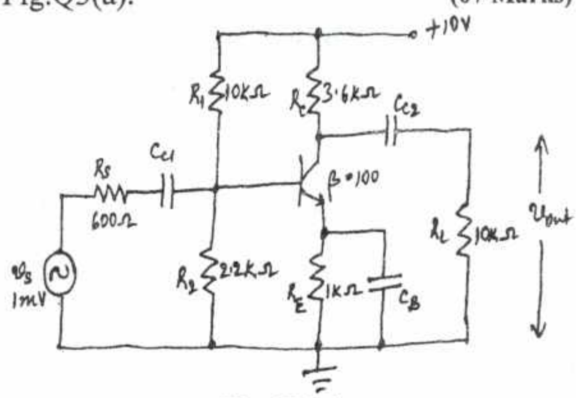


Fig.Q3(c)

b. Write a neat circuit diagram of a CC amplifier. Draw its AC equivalent circuit and derive expressions for voltage gain, input impedance and output impedance. What is the application of a CC amplifier? Indicate the other name for a CC amplifier & justify this name. **(07 Marks)**

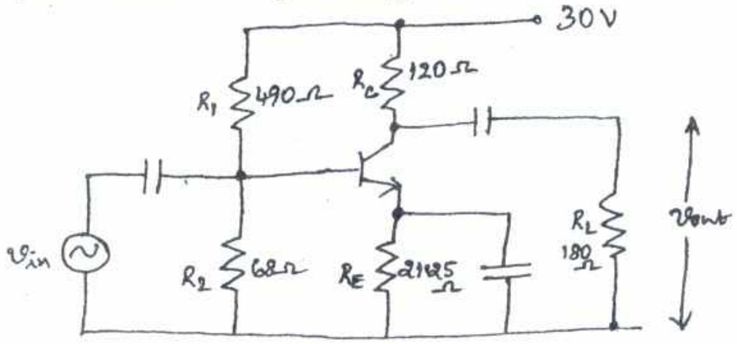
c. In the circuit shown in Fig.Q3(c), suppose $v_{out} = 0$ V, dc collector voltage is 6 V and AC collector voltage is 70 mV. With logical reasoning, identify the faulty component. **(06 Marks)**

4 a. Explain the classification of amplifiers, based on the type of coupling and frequency spectrum of operation. **(04 Marks)**

b. Briefly compare the class A, class B and class D amplifiers regarding angle of conduction and efficiency. **(06 Marks)**

c. Draw a DC load line and AC load line for the circuit shown in Fig.Q4(c) and calculate the maximum peak-to-peak undistorted output voltage. **(10 Marks)**

Fig.Q4(c)



PART – B

5 a. An n-channel D-MOSFET has $V_{GS(Off)} = -3V$ and $I_{DSS} = 6$ mA. What is I_D when $V_{GS} = -2V$ and when $V_{GS} = +2V$? Explain the terms $V_{GS(Off)}$ and I_{DSS}. **(06 Marks)**

b. Explain the need for active load switching in n-channel E-MOSFET inverter circuit. Explain how it is done using the 2-terminal curve. **(08 Marks)**

c. Explain the working of CMOS inverter, with the help of a neat circuit diagram and waveforms. Comment on its power consumption. **(06 Marks)**

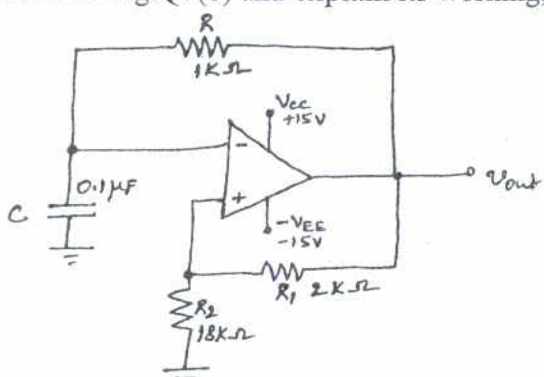
6 a. What are AC and DC amplifiers? Draw the frequency response for a typical AC amplifier and give reasons for the shape of the response curve. If mid-band gain is 200, lower and upper half power frequencies are 20 Hz and 20 kHz respectively, what is the gain at 5 Hz, 300Hz, 1 kHz and 200kHz? What is the bandwidth and mid-band region for this amplifier? **(10 Marks)**

b. Mention the different types of negative feedback amplifiers. Draw the block diagram of a VCVS amplifier. Write a neat circuit diagram of a VCVS amplifier, using an opamp and derive an expression for its voltage gain. **(10 Marks)**

7 a. With a neat diagram, explain the working of an inverting Schmitt trigger. Write the expressions for UTP and LTP and draw a graph of output versus input. **(06 Marks)**

b. Identify the circuit shown in Fig.Q7(b) and explain its working, with neat waveforms.

Fig.Q7(b)



(06 Marks)

c. With a neat diagram, explain the internal structure of 555 timer. Explain the external connections to be made to make it work as a monostable multivibrator. Draw neat waveforms of the trigger input, monostable output and voltage across the capacitor. Write an expression for time period. **(08 Marks)**

8 a. Define the terms load regulation, output resistance and line regulation for a voltage regulator. The measured values for a voltage regulator are: $V_{NL} = 9.91$ V , $V_{FL} = 9.81$ V, $V_{HL} = 9.94$ V and $V_{LL} = 9.79$ V. Calculate load regulation, output resistance and line regulation. Assume that full load current is 1 A. **(06 Marks)**

b. What are the series and shunt voltage regulators? What are their advantages and disadvantages? For the circuit shown in Fig.Q8(b), derive the expression for output voltage. Identify the function of the circuit. Calculate the values of V_{out}, I_L, I_c, I_{R3}, I_{Rs}, I_{in}, I_{R2}, P_{in}, P_{out} and efficiency. **(08 Marks)**

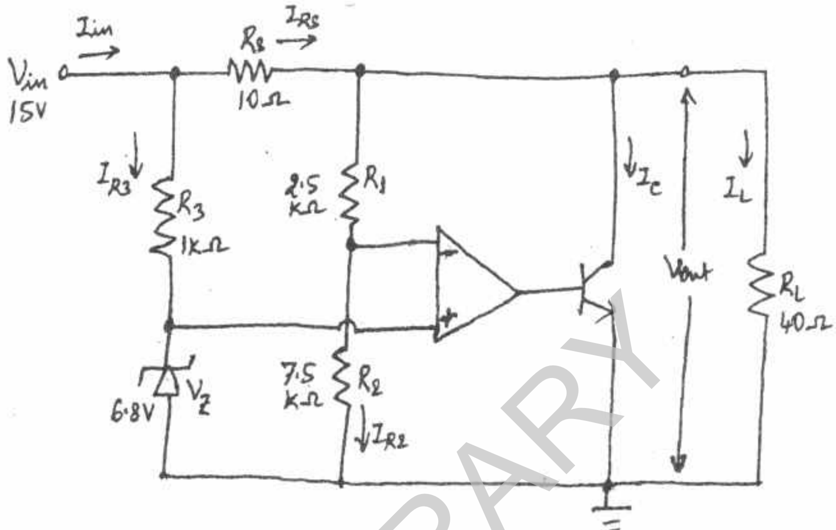


Fig.Q8(b)

c. Identify the function of the circuit shown in Fig.Q8(c). Derive the expression for V_{out}, I_L, I_E, I_{R3}, I_{in}, I_{R2}, P_{in}, P_{out} and efficiency. **(06 Marks)**

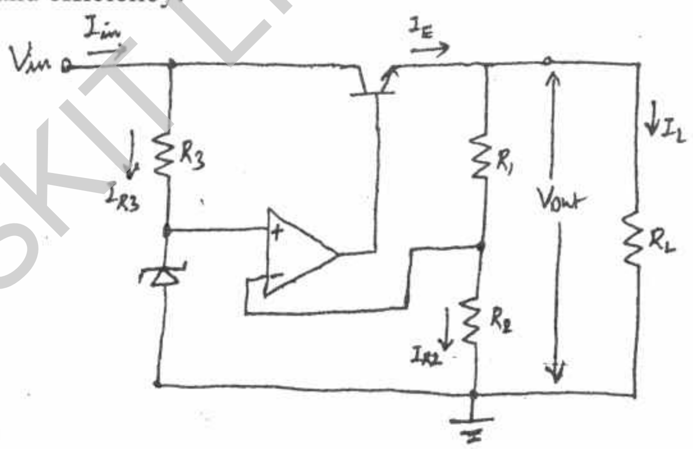


Fig.Q8(c)

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USN | | | | | | | | | | 06CS33

Third Semester B.E. Degree Examination, December 2010

Logic Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Draw the logic circuit whose Boolean equation is $Y = \overline{A+B} + \overline{C}$, use only NAND gates. **(04 Marks)**

b. Find the minimal sum and minimal product using Karnaugh map.
$$f(a,b,c,d) = \sum m(6,7,9,10,13) + d(1,4,5,11)$$ **(08 Marks)**

c. Find the prime implicants for the following function using Quine Mccluskey method:
$$f(a,b,c,d) = \sum m(1,2,8,9,10,12,13,14)$$ **(08 Marks)**

2 a. Implement the following function using a 8 : 1 multiplexer :
$$f(a,b,c,d) = \sum m(0,1,5,6,8,10,12,15)$$ **(05 Marks)**

b. Describe the working principle of a 3 : 8 decoder. Realize the following Boolean expressions using the 3 : 8 decoder :
$$F_1(A,B,C) = \sum m(1,2,3,4) \qquad F_2(A,B,C) = \sum m(3,5,7)$$ **(06 Marks)**

c. What is PLA? How does PLA differ from PAL? **(05 Marks)**

d. Write HDL code for a 4 to 1 Mux considering any model. **(04 Marks)**

3 a. How is 2's complement representation used to perform subtraction? Give an example. **(04 Marks)**

b. Show how two 7483 can be used to add/subtract two 8 bit numbers. Draw a neat diagram and explain its working. **(08 Marks)**

c. Design a 2 bit fast adder. Give its implementation using gates. **(08 Marks)**

4 a. Calculate the clock cycle time for a system that uses a clock, that has a frequency of :
i) 10 MHz ii) 6 MHz iii) 750 KHz **(03 Marks)**

b. With a neat block diagram, explain the working of a Master-Slave JK flip flop. Also write its truth table. **(07 Marks)**

c. Explain the function of the circuit shown here with the state transition diagram. **(10 Marks)**

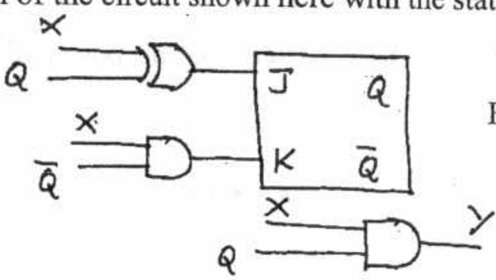

Fig.Q4(c)

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 – B

5 a. Draw the logic diagram of a 4 bit serial in serial out shift register using JK flip flop and explain its working with an example. **(05 Marks)**

b. Give the HDL code for a shift register of 5 bits constructed using D flip flops. **(03 Marks)**

c. Construct a mod 8 asynchronous counter and write the truth table and draw waveforms. **(06 Marks)**

d. Design a mod 4 synchronous counter using a –ve edge triggered JK flip flop. Draw the state transition diagram. **(06 Marks)**

6 a. For the following state transition diagram, design equations for Moore model and generate the circuit diagram. **(10 Marks)**

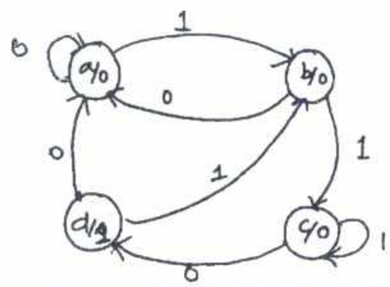

Fig.Q6(a)

b. Design an asynchronous sequential logic circuit for state transition diagram shown below:

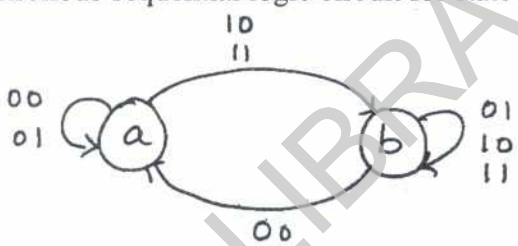

Fig.Q6(b)

(06 Marks)

c. How does state transition diagram of a Moore machine differ from Mealy machine? **(04 Marks)**

7 a. Draw a binary ladder network for a digital input 1000 and obtain its equivalent circuit. **(06 Marks)**

b. Explain the concept of "successive approximation" of a A/D converter. **(08 Marks)**

c. In a 8 bit counter type A/D converter driven by 500 KHz clock, find :

i) Conversion time

ii) Average conversion time

iii) Maximum conversion time. **(06 Marks)**

8 a. Explain the working of CMOS NAND, NOR gates. **(08 Marks)**

b. Explain with a neat diagram, working of a 2 input NAND gate TTL with totempole output. **(07 Marks)**

c. Explain how transistor acts as a switch. Define power dissipation and propagation delay time. **(05 Marks)**

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USN | | | | | | | | | | 06CS34

Third Semester B.E. Degree Examination, December 2010
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks:100

Note: ***Answer any 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. Determine the sets A and B, given that $A - B = \{1, 3, 7, 11\}$, $B - A = \{2, 6, 8\}$ and $A \cap B = \{4, 9\}$. **(04 Marks)**

b. Using the Venn diagram, prove that $A \Delta (B \Delta C) = (A \Delta B) \Delta C$. **(05 Marks)**

c. A professor has two dozen introductory text books on computer science and is concerned about their coverage of the topics (A) Compilers, (B) Data structures and (C) Operating systems. The following data are the number of books that contain material on these topics: $|A| = 8$, $|B| = 13$, $|C| = 13$, $|A \cap B| = 5$, $|A \cap C| = 3$, $|B \cap C| = 6$, $|A \cap B \cap C| = 2$

i) How many of the text books include material on exactly one of these topics?

ii) How many do not deal with any of the topics?

iii) How many have no materials on compilers? **(06 Marks)**

d. Show that (0, 1) is an uncountable set. **(05 Marks)**

2 a. By constructing truth tables, show that $[(p \vee q) \to r] \Leftrightarrow [(p \to r) \wedge (q \to r)]$. **(05 Marks)**

b. Define tautology. Prove that $[(P \vee Q) \wedge \neg\{\neg P \wedge (\neg Q \vee \neg R)\}] \vee (\neg P \wedge \neg Q) \vee ((\neg P \wedge \neg R)$ is a tautology without using truth tables. **(05 Marks)**

c. Define the dual of a logical statement. Write the dual of $(P \vee T_0) \wedge (q \vee F_0) \wedge (r \wedge s \wedge T_0)$. **(04 Marks)**

d. Test the validity of the following argument:

i) If I study, I will not fail in the examination.

ii) If I do not watch TV in the evenings, I will study.

iii) I failed in the examination.

iv) Therefore, I must have watched TV in the evenings. **(06 Marks)**

3 a. Define: i) Open sentence ii) Quantifiers.

Write the following propositions in symbolic form and find its negation:

"All integers are rational numbers and some rational numbers are not integers". **(07 Marks)**

b. Let $p(x) : x \geq 0$, $q(x) : x^2 \geq 0$ and $r(x) : x^2 - 3x - 4 = 0$. Then for the universe comprising of all the real numbers, find the truth values of

i) $\exists x, [p(x) \wedge q(x)]$,

ii) $\forall x, [p(x) \to q(x)]$ and

iii) $\exists x, [p(x) \wedge r(x)]$. **(06 Marks)**

c. Give i) a direct proof, ii) an indirect proof for the following statement:

"If n is an odd integer, then (n + 9) is an even integer". **(07 Marks)**

4 a. For all the positive integers n, prove that if $n \geq 24$, then n can be written as a sum of 5's and / or 7's. **(07 Marks)**

b. If $F_0, F_1, F_2, \ldots\ldots\ldots$ are Fibonacci numbers, prove that $\sum_{i=0}^{n} F_i^2 = F_n \times F_{n+1}$. **(07 Marks)**

c. A sequence $\{ a_n \}$ is defined recursively by $a_1 = 4$, $a_n = a_{n-1} + n$, for $n \geq 2$. Find a_n in explicit form. **(06 Marks)**

PART – B

5 a. Define the Cartesian product of two sets. For any three non-empty sets A, B and C, prove that $A \times (B - C) = (A \times B) - (A \times C)$ **(05 Marks)**

b. Shirts numbered consecutively from 1 to 20 are worn by 20 students of a class. When any 3 of these students are chosen to be a debating team from the class, the sum of their shirt numbers is used as the code number of the team. Show that if any 8 of the 20 are selected, then from these 8 we may form at least two different teams having the same code number. **(05 Marks)**

c. i) Let A and B be finite sets with $| A | = m$ and $| B | = n$. Find how many functions are possible from A and B?

ii) If there are 2187 functions from A to B and $| B | = 3$, what is $| A |$? **(05 Marks)**

d. Let $A = B = C = R$ and $f : A \rightarrow B$ and $g : B \rightarrow C$ be defined by $f(a) = 2a + 1$, $g(b) = ⅓\, b$, $\forall a \in A$, $\forall b \in B$. Compute $g \circ f$ and show that $g \circ f$ is invertible. What is $(g \circ f)^{-1}$? **(05 Marks)**

6 a. Let $A = \{ 1, 2, 3, 4, 6 \}$ and R be a relation on A defined by aRb if and only if "a is a multiple of b". Write down the relation matrix M(R) and draw its digraph. **(06 Marks)**

b. In the following problems, consider the partial order of divisibility on the set A. Draw the Hasse diagram of the poset and determine whether the poset is linearly ordered (totally ordered) or not.

i) $A = \{ 1, 2, 3, 5, 6, 10, 15, 30 \}$ ii) $A = \{ 2, 4, 8, 16, 32 \}$ **(07 Marks)**

c. Let $A = \{ 1, 2, 3, 4, 5 \} \times \{ 1, 2, 3, 4, 5 \}$. Define a relation R on A by $(x_1, y_1)\, R\, (x_2, y_2)$ iff $x_1 + y_1 = y_2 + x_2$.

i) Verify that R is an equivalence relation on R.

ii) Determine the partition of A induced by R. **(07 Marks)**

7 a. Define a group, with an example. **(06 Marks)**

b. State and prove the Lagrange's theorem. **(06 Marks)**

c. Define the homomorphism and isomorphism in a group. Let f be homomorphism from a group G_1 to a group G_2. Prove that

i) If e_1 is the identity in G_1 and e_2 is the identity in G_2, then $f(e_1) = e_2$.

ii) $f(a^{-1}) = [f(a)]^{-1}$ for all $a \in G_1$. **(08 Marks)**

8 a. For all $x, y \in Z_2^n$, prove that $wt(x + y) \leq wt(x) + wt(y)$. **(04 Marks)**

b. Let $E : Z_2^m \rightarrow Z_2^n$, $m < n$ be an encoding function given by a generator matrix G or the associated parity check matrix H. Prove that $C = E(Z_2^m)$ is a group code. **(08 Marks)**

c. Let $u = \{ 1, 2 \}$ and $R = P(u)$. Define '+' '.' on the elements of R by $A + B = A \Delta B$, $A \cdot B = A \cap B$. Prove that R is a commutative ring with unity but not an integral domain. **(08 Marks)**

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06CS35

Third Semester B.E. Degree Examination, December 2010
Data Structures with C

Time: 3 hrs. Max. Marks:100

Note: ***Answer any 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. What is a pointer? How do you declare and initialize the pointers? How do you access the value pointed to by a pointer? **(05 Marks)**

b. What is static and dynamic memory allocation? Explain with examples, the dynamic memory allocation functions. **(10 Marks)**

c. What is the output of the following code?

```
int num[5] = { 3, 4, 6, 2, 1 };
int *p = num;
int *q = num + 2;
int *r = &num[1];
Printf("%d %d", num[2], *(num + 2));
Printf("%d %d", *p, *(p + 1));
Printf("%d %d", *q, *(q + 1));
Printf("%d %d", *r, *(r + 1));
```
(05 Marks)

2 a. Explain the following string functions, with examples:
i) STRTOK ii) STRCMP iii) STRTOL iv) STRSTR **(12 Marks)**

b. Write a C program to represent a complex number, using structure and multiply 2 complex numbers. **(08 Marks)**

3 a. Define stack. List the operations on stack. Write the C implementation of these operations. **(12 Marks)**

b. Implement reversing a string, using a stack in C. **(08 Marks)**

4 a. Write an algorithm for evaluating a valid postfix expression. Trace the same on
1 2 3 + * 3 2 1 – + * **(10 Marks)**

b. What is the advantage of circular queue over linear queue? Write C routines for inserting and deleting an element from the circular queue. **(10 Marks)**

PART – B

5 a. What is recursion? Write recursion function for finding maximum of n numbers. **(08 Marks)**

b. Briefly explain the structures of different types of linked lists. Write a C function to count number of elements present in a singly linked list. **(12 Marks)**

6 a. How can an ordinary queue be represented, using a singly linked list? Write C functions for linked implementation of ordinary queue insertion and deletion. **(10 Marks)**

b. Write a C program to perform the following operations on doubly linked list:
   i) Insert a node
   ii) Delete a node. **(10 Marks)**

7 a. What are binary trees? Mention different types of binary trees and explain briefly. **(06 Marks)**

b. Write C functions for the following tree traversals:
   i) Inorder
   ii) Preorder
   iii) Postorder. **(06 Marks)**

c. Write an algorithm to construct a binary tree for the inputs
   14, 15, 4, 9, 7, 18, 3, 5, 16, 4, 20, 17, 9, 14, 5
   indicating a message for duplicate members. Draw the tree constructed by the above program. **(08 Marks)**

8 Write short notes on:
   a. Unions
   b. Circular lists
   c. Threaded binary tree
   d. Types of files. **(20 Marks)**

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Third Semester B.E. Degree Examination, December 2010
UNIX and Shell Programming

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the architecture of UNIX operations system. **(08 Marks)**
b. Describe the salient features of the UNIX operating systems. **(08 Marks)**
c. Write a note on the man command. **(04 Marks)**

2 a. Explain the different types of files supported in UNIX. **(06 Marks)**
b. Interpret the significance of the seven fields of the *ls – l* output. **(07 Marks)**
c. Explain the three modes of the Vi editor. **(07 Marks)**

3 a. What are the standard input, standard output and standard error? Explain with respect to UNIX. **(10 Marks)**
b. What are file attributes? Explain how to change the basic file permissions, with an example. **(06 Marks)**
c. Explain the grep, with examples. **(04 Marks)**

4 a. How is a process created? Mention briefly the role of fork and exec system calls in the process creation. **(08 Marks)**
b. Define a job. How is job control done in UNIX? **(06 Marks)**
c. What are the shell variables that control the UNIX systems called? Explain atleast five of them. **(06 Marks)**

PART – B

5 a. Explain the following commands with an examples:
i) Head ii) Port iii) tr iv) Talk v) wc **(10 Marks)**
b. What is shell programming? Explain the shell feature of while and for with syntax. **(10 Marks)**

6 a. Explain the use of test and [ ] to evaluate expressions in shell. **(08 Marks)**
b. Explain the variable and operators in PERL. **(06 Marks)**
c. State any six built in variables in awk and explain each. **(06 Marks)**

7 a. Explain the list and array used in perl. Also write a perl program to convert decimal number to binary number. **(10 Marks)**
b. What is a hev document? Explain with an example. Also mention its use. **(05 Marks)**
c. Using command line arguments, write a perl program to find whether a given year is leap year. **(05 Marks)**

8 a. Write a note on awk, with options. **(06 Marks)**
b. Explain string handling functions in perl. **(06 Marks)**
c. How is file managed in perl? Explain with an example. **(08 Marks)**

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USN

MATDIP301

Third Semester B.E. Degree Examination, December 2010
Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

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

1 a. Find the n^{th} derivative of $\log(ax + b)$. **(06 Marks)**

b. Find the n^{th} derivative of $\dfrac{x}{(1+3x+2x^2)}$. **(07 Marks)**

c. If $x = \sin t$ and $y = \text{cons}\ mt$, prove that $(1 - x^2)\, y_{n+2} - (2n + 1)\, xy_{n+1} + (m^2 - n^2)\, y_n = 0$. **(07 Marks)**

2 a. Show that the following pair of curves intersect each other orthogonally.
$r = a(1 + \sin\theta)$ and $r = a(1 - \sin\theta)$. **(06 Marks)**

b. Find the pedal equation of the curve $\dfrac{2a}{r} = 1 + \cos\theta$. **(07 Marks)**

c. Find the first five terms of the Maclaurin series of $f(x) = \log \sec x$. **(07 Marks)**

3 a. If $u = e^{ax - by} \sin(ax + by)$, show that $b\dfrac{\partial u}{\partial x} - \dfrac{\partial u}{\partial y} = 2abu$. **(06 Marks)**

b. If $u = \sqrt{x^2 + y^2}$ and $x^3 + y^3 + 3axy = 5a^2$, find $\dfrac{du}{dx}$ when $x = y = a$. **(07 Marks)**

c. If $z = f(x, y)$, where $x = r\cos\theta$ and $y = r\sin\theta$, show that, $\left(\dfrac{\partial z}{\partial x}\right)^2 + \left(\dfrac{\partial z}{\partial y}\right)^2 = \left(\dfrac{\partial z}{\partial r}\right)^2 + \dfrac{1}{r^2}\left(\dfrac{\partial z}{\partial \theta}\right)^2$ **(07 Marks)**

4 a. Obtain the reduction formula for $\int \cos^n x\,dx$, where n is a positive integer. **(06 Marks)**

b. Show that $\displaystyle\int_0^{\pi} \frac{\sqrt{1-\cos\theta}}{1+\cos\theta} \sin^2\theta\ d\theta = \frac{8\sqrt{2}}{3}$. **(07 Marks)**

c. Evaluate $\displaystyle\int_0^{a}\int_0^{\sqrt{a^2-x^2}} x^2 y\,dy\,dx$. **(07 Marks)**

5 a. Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. **(06 Marks)**

b. Show that $\displaystyle\int_0^{\pi/2} \sqrt{\sin\theta}\, d\theta \times \int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} = \pi$. **(07 Marks)**

c. Prove that $\beta(m,n) = \dfrac{\Gamma(m)\,\Gamma(n)}{\Gamma(m+n)}$. **(07 Marks)**

6 a. Solve $(e^4 + 1) \cos x\, dx + e^4 \sin x\, dy = 0$. **(06 Marks)**

b. Solve $\left(x \tan \frac{y}{x} - y \sec^2 \frac{y}{x}\right)ds + x \sec^2\left(\frac{y}{x}\right)dy = 0$. **(07 Marks)**

c. Solve $(x + \tan y)\, dy = \sin 2y\, dx$. **(07 Marks)**

7 a. Solve $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=e^{-2x}$. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2}+2\frac{dy}{dx}-5y=\cos 3x$. **(07 Marks)**

c. Solve $(D^2 - 5D + 1)y = 1 + x^2$. **(07 Marks)**

8 a. Prove that $(1 + \cos\theta + i\sin\theta)^n + (1+ \cos\theta - i\sin\theta)^n = 2^{n+1}\cos^n\left(\frac{\theta}{2}\right)\cos\left(\frac{n\theta}{2}\right)$. **(06 Marks)**

b. Use Demoivre's theorem and solve the equation $x^4 - x^3 + x^2 + 1 = 0$. **(07 Marks)**

c. Expand $\cos^8\theta$ in a series of cosine of multiples of θ. **(07 Marks)**

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