CS/IS

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

Third Semester B.E. Degree Examination, December 2011
Engineering Mathematics

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 a Fourier series to represent $f(x) = \begin{cases} 0 & -\pi \le x \le 0 \\ x^2 & 0 \le x \le \pi \end{cases}$. **(06 Marks)**

b. Find half range cosine series of $f(x) = 1 - \frac{x}{l}$ in (o, l). **(07 Marks)**

c. Compute the Fourier coefficients a_0, a_1, a_2, b_1 and b_2 for f(x) tabulated below: **(07 Marks)**

x	0	1	2	3	4	5
f(x)	9	18	24	28	26	30

2 a. Find Fourier transform of,

$$f(x) = \frac{1}{2a} \quad |x| \le a$$
$$= 0 \quad |x| > a$$
(06 Marks)

b. Find Fourier cosine transform of e^{-ax}, $a \ge 0$, hence find $\int_0^\infty \frac{\cos \alpha x}{a^2 + \alpha^2} dx$. **(07 Marks)**

c. Find the inverse Fourier sine transform of $\frac{1}{s} e^{-as}$. **(07 Marks)**

3 a. Form the second order partial differential equation of $z = xf(ax + by) + g(ax + by)$. **(06 Marks)**

b. Solve : $(y + zx)z_x - (x + yz)z_y = x^2 - y^2$. **(07 Marks)**

c. Solve : $3u_x + 2u_y = 0$, given $u(x, 0) = 4e^{-x}$ using method of separation of variables. **(07 Marks)**

4 a. With suitable assumptions, derive one dimensional equation for heat flow. **(06 Marks)**

b. Solve : $\frac{\partial^2 u}{\partial t^2} = c^2 u_{xx}$ by the method of separation of variables. **(07 Marks)**

c. Solve $u_{xx} + u_{yy} = 0$, for $0 < x < a$, $0 < y < b$ and $u(x, 0) = 0$; $u(x, b) = 0$; $u(0, y) = 0$; $u(a, y) = f(y)$. **(07 Marks)**

PART – B

5 a. Find the third approximate root of $xe^x - 2 = 0$, by Regula Falsi method. **(06 Marks)**

b. Using Gauss Seidel method of iteration, find a, b, c (4th iteration values), given $5a - b = 9$, $a - 5b + c = -4$, $b - 5c = 6$ taking $\left(\frac{9}{5}, \frac{4}{5}, \frac{6}{5}\right)$ as first approximation. **(07 Marks)**

c. Find all the eigen values and the eigen vector corresponding to smallest eigen value of :

$$\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$$
(07 Marks)

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.

6 a. Given the following table of x and f(x), fit a Lagrangian polynomial and hence find f(1) and f(4). **(06 Marks)**

x	-1	0	2	3
f(x)	-8	3	1	2

b. Using Newton's dividend different formula, find f(2, 5) given:

x	-3	-1	0	3	5
f(x)	-30	-22	-12	330	3458

(07 Marks)

c. Tabulate the values y =$\log_e x$, $4 \le x \le 5.2$, in steps of 0.2 and find $\int_4^{5.2} \log_e x \, dx$ using Simpons' $\frac{3}{8}$ rule. **(07 Marks)**

7 a. Derive eulers' equation for extremal value in the form $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$. **(06 Marks)**

b. Determine the plane curve down which a particle will slide down without friction from $A(x_1, y_1)$ to $B(x_2, y_2)$ in shortest time. **(07 Marks)**

c. The curve 'C' joining the two points $A(x_1, y_1)$ to $B(x_2, y_2)$ is rotated about x-axis, find equation of 'C' such that the solid of resolution has minimum surface area. **(07 Marks)**

8 a. Find $z(e^{-an} \sin n\theta)$ and $z(n \cos n\theta)$. **(06 Marks)**

b. Find z^{-1} of $\left\{\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}\right\}$. **(07 Marks)**

c. Solve : $u_{n+2} + 2u_{n+1} + u_n = n$ given $u_0 = u_1 = 0$. **(07 Marks)**

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06CS32

Third Semester B.E. Degree Examination, December 2011
Electronic Circuits

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define the condition for stiff clipper and stiff clamper. **(02 Marks)**

b. With a neat diagram and waveform, explain the working of
i) Positive clipper ii) Negative clarper. **(10 Marks)**

c. Sketch the output waveform of the circuit shown below for a sinusoidal input of 10 V peak. (Assume Si diodes). **(04 Marks)**

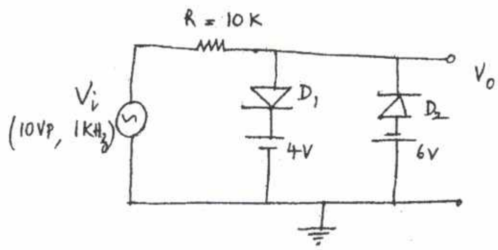

Fig. Q1(c)

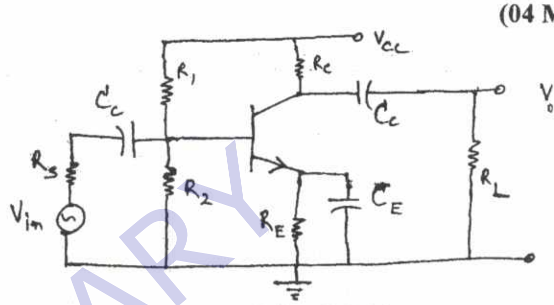

Fig. Q2(b)

d. Write a note on schottkey diode. **(04 Marks)**

2 a. Define the following terms of a transistor amplifier circuit.
i) Q – point ii) Load line iii) AC emitter resistance (re). **(06 Marks)**

b. Find the Q – point of the circuit shown below. Also find the AC emitter resistance (re).
$V_{CC} = +12$ V ; $R_1 = 82$ K ; $R_2 = 18$ K ; $R_C = 4.7$ K ; $R_E = 1.2$ K ; $\beta = 90$; $R_S = 500\ \Omega$; $R_L = 100$ K. (Transistor – Si). **(10 Marks)**

c. Find the value of 'C' needed for effective bypass in the circuit shown below. Input signal frequency is 1.2 KHz. **(04 Marks)**

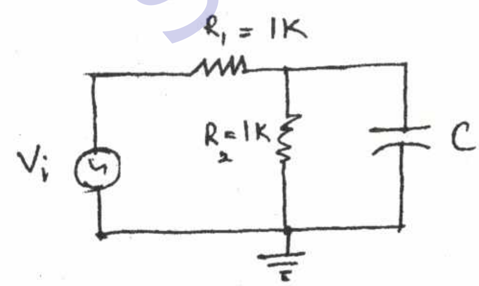

Fig. Q2(c)

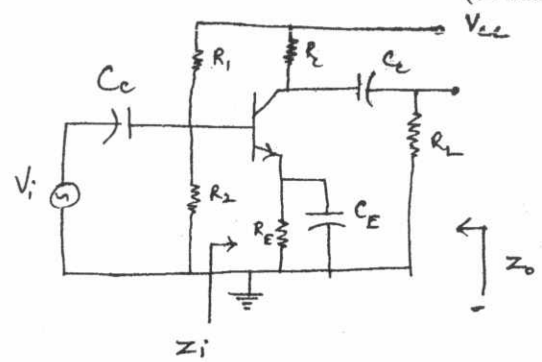

Fig. Q3(a)

3 a. Find the voltage gain, current gain, Z_i, Z_o and power gain for the CE amplifier circuit shown below. Derive all the formulas used.
$R_1 = 10$ K ; $R_2 = 2.2$ K ; $R_E = 1$ K ; $R_C = 3.6$ K ; $R_L = 10$ K ; $V_{CC} = +10$ V ; $\beta = 95$. **(10 Marks)**

b. What is a swamped amplifier? What is its advantages? List the characteristics of the amplifier. **(05 Marks)**

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.

For the Darlington amplifier circuit shown below, find the base current of Q_1, overall current gain, and also its input resistance. **(05 Marks)**

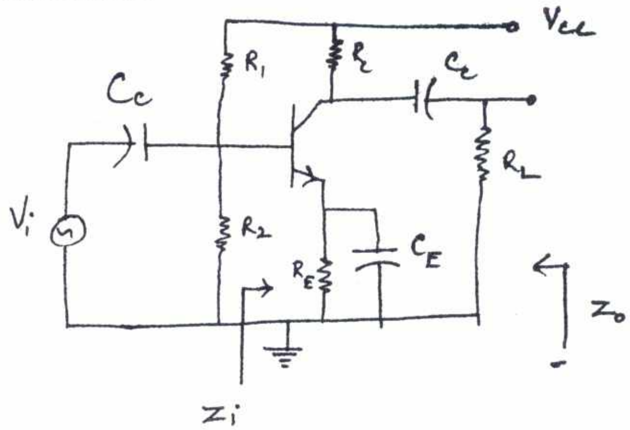

Fig. Q3(c)

4 a. What are power amplifiers? Give the graphical representations of the classes of power amplifiers. **(10 Marks)**

b. Explain the working of a class B pushpull amplifier. What is maximum conversion η? **(06 Marks)**

c. Find the Bandwidth of class 'C' amplifier. If the tuning circuit components are 470 pF and 2 μH and the quality factors of the circuit is 100. **(04 Marks)**

PART – B

5 a. Define the following terms of a MOSFET. i) I_{DSS} ii) $V_{GS(off)}$ iii) V_T. **(06 Marks)**

b. With a net diagram and characteristics, explain the working of a n channel enhancement mode MOSFET. **(06 Marks)**

c. Draw the circuit of a CMOS inverter and explain its working. Find the output voltage of the inverter. If V_{DD} = 20 V, $R_{D(ON)}$ = 6 Ω, for an input pulse varying from 0 – 10 V. sketch waveforms. **(08 Marks)**

6 a. Define the following terms of an amplifier

i) Frequency response ii) Cut off frequencies iii) Band width. **(06 Marks)**

b. For an AC amplifier circuit shown below, if the midband voltage gain is 250, F_L = 25 Hz, F_H = 200 KHz. Draw its frequency response. Also find the gain of the amplifier at 10 Hz and 900 KHz. **(04 Marks)**

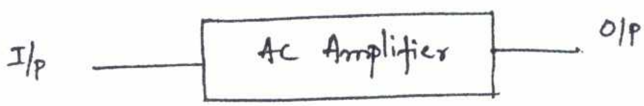

Fig. Q6(b)

c. Explain the four types of negative feedback amplifiers. **(10 Marks)**

7 a. Explain the working of an inverting schemitt trigger and give the expressions for UTP and LTP. **(06 Marks)**

b. Design an opamp relaxation oscillator to generate a square wave of 2 KHz and duty cycle 0.5. Draw output and capacitor waveform. Take β = 0.5. **(08 Marks)**

c. Explain the working of astable multivibrator using IC555, with a neat circuit diagram and internal diagram. **(06 Marks)**

8 a. Define load regulation, line regulation and output resistance of a regulator. Calculate % regulation if V_{NL} = 9.91 V and V_{FL} = 9.79 V. **(08 Marks)**

b. Draw circuit diagram of zener and two transistor discrete series regulator and derive equations for output voltage. **(12 Marks)**

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Third Semester B.E. Degree Examination, December 2011
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. Table (1.1) shows a special code called gray code. For each gray there is a corresponding binary code. Design a code converter circuit which converts 4 bit gray code to a 4 bit binary code using only X – OR gates. **(12 Marks)**

A	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
B	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0
C	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0
D	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0

Table 1.1

b. Implement the following equations using only three half adders [Note: using a single circuit]
i) $A \oplus B \oplus C$ ii) $\overline{A}BC + A\overline{B}C$ iii) $ABC + AB\overline{C}$ iv) ABC. **(04 Marks)**

c. Simplify the following equations using K – map.
i) $Y = F(A, B, C) = \sum m(1, 2, 3, 6, 7)$
ii) $Y = F(A, B, C, D) = \sum m(1, 2, 3, 6, 8, 9, 10, 12, 13, 14)$ **(04 Marks)**

2 a. A car safety alarm considers four inputs: Door closed (D), key in (K), seat pressure (S) and belt closed (B). The alarm (A) should sound if
* The key is in and the door is not closed (or) * The door is closed, the key is in, the driver is in the seat and the seat belt is not fastened.
i) Construct the truth table ii) Implement the above function using 8 : 1 MUX. **(06 Marks)**

b. Using a decoder and external gates, design the combinational circuit defined by the following three boolean functions.
i) $f1 = (\overline{y} + x)z$ ii) $f2 = \overline{y}\,\overline{z} + x\overline{y} + x\overline{z}$ iii) $f3 = (\overline{x} + y)z$. **(06 Marks)**

c. Design a 4 bit priority encoder, with D_o having the highest priority and I/p D_3 the lowest priority. **(08 Marks)**

3 a. Explain the 4 bit adder – subtractor circuit, with an example. **(06 Marks)**

b. Show the 8 bit addition of these decimal numbers in 2'S complement representation.
i) + 89, – 34 ii) + 45, + 56. **(04 Marks)**

c. Explain carry look ahead adder. **(10 Marks)**

4 a. Derive the characteristic equation for JK flip flop and draw the state transition diagram for the same. **(06 Marks)**

b. Explain the Melay and Moore model of sequential circuit, with an example. **(06 Marks)**

c. A sequential circuit has two JK flip flops A and B, two inputs x and y and one output z. The flip flop I/P equations and circuit output equations are,

$J_A = Bx + \overline{B}\,\overline{y}$ $K_A = \overline{B}\ x\overline{y}$

$J_B = \overline{A}x$ $K_B = A + x\overline{y}$

$Z = A\overline{x}\,\overline{y} + B\overline{x}\,\overline{y}$

i) Draw the logic diagram ii) Tabulate the state analysis table
iii) Derive state equations for A and B. **(08 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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PART – B

5 a. Explain the 4 bit programmable sequence detector and serial adder. **(10 Marks)**

b. Design a 3 bit binary up/down counter (synchronous) using T – flip flop. **(10 Marks)**

6 Design a sequential circuit which detects the given valid sequence, using D flip flop. Obtain the state diagram as well as state table.

The specification is as follows.

The sequential N/w having a single I/P line x, in which the symbols 0 and 1 are applied, and a single O/P line Z. An O/P of 1 is to be produced, coincident with the first 0 I/P symbol if it is followed exactly one or three 1 I/P symbols. All other times the N/w is to produce 0 output. Example sequence. **(20 Marks)**

x	0	1	0	0	0	1	1	0	1	1	1	0	1	0	1	1	1	1	0
y	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0

7 a. Briefly discuss the Binary Ladders and explain 4 bit ladder. **(05 Marks)**

b. Explain the 4 – bit D/A converter, with a neat block diagram. **(08 Marks)**

c. Explain the 3 bit simultaneous A/D converter, with logic diagram, using 93/8 priority encoder. **(07 Marks)**

8 Explain in detail, all the TTL parameters. **(20 Marks)**

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Third Semester B.E. Degree Examination, December 2011
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define set, power set, complement of a set. Give one example for each. **(06 Marks)**

b. One hundred students were asked whether they had taken courses in any of the three areas, Kannada, English and Hindi. The results were: 45 had taken Kannada, 38 had taken English, 21 had taken Hindi, 18 had taken Kannada and English, 9 had taken Kannada and Hindi, 4 had taken Hindi and English and 23 had taken no course in any of the areas. Draw a Venn diagram that shows the result of the survey and determine the number of students, who had taken course in exactly, i) One of the areas and ii) Two of the areas. **(08 Marks)**

c. If A and B are events in a finite sample space E and $A \subset B$, then show that, $P(A) \leq P(B)$. **(06 Marks)**

2 a. Define logical connectives conjuction and disjunction, with the corresponding truth table. **(06 Marks)**

b. Construct the truth table for $\neg(P \wedge Q) \Leftrightarrow (\neg P \vee \neg Q)$. **(06 Marks)**

c. Test the validity of the following argument.
If I like mathematics, than I will study
Either I study or I fail
Therefore if I fail, then I do not like mathematics. **(08 Marks)**

3 a. Let p(x) denotes the sentence "x + 2 > 5". State whether or not p(x) is a proportional function on each of the following sets:
i) N, the set of +ve integers ii) C, the set of complex numbers. **(04 Marks)**

b. Negate the following statements:
i) $\forall x\, p(x) \wedge \exists y\, q(y)$ ii) $\exists x\, p(x) \vee \forall y\, q(y)$. **(04 Marks)**

c. Define rule of universal specification and rule of universal generalization. Also write their symbolical notation forms. **(06 Marks)**

d. Prove by Mathematical Induction that,
$$1 + 2 + 3 + \ldots\ldots\ldots\ldots\ldots + n = \frac{n(n+1)}{2}.$$ **(06 Marks)**

4 a. Prove that $2^n \geq n^2$ for $n \geq 4$. **(06 Marks)**

b. What is meant by a recursively defined function? Calculate 4! Using the recursive function. **(06 Marks)**

c. Define the Cartesian product of two sets. Let A = {2, 3, 4} and B {4, 5}. Then find
i) A x B ii) B x V iii) B^2 iv) A^2 **(08 Marks)**

PART – B

5 a. Let R be the relation from A = {1, 2, 3,4} to B {x, y, z} defined by R = {(1, y), (1, z), (3, y), (4, x), (4, z)}. Determine the domain, range and inverse relation of R. **(05 Marks)**

b. Define the one – one and onto function. Give one example for each. **(04 Marks)**

c. If $f : A \to B$ with $A_1, A_2 \subseteq A$. Then prove that i) $f(A_1 \cup A_2) = f(A_1) \cup f(A_2)$
ii) $f(A_1 \cap A_2) \subseteq f(A_1) \cap f(A_2)$. **(06 Marks)**

d. State the Pigeonhole principle. Give one suitable example which satisfies the principle. **(05 Marks)**

6 a. Define composition function, with an example. **(04 Marks)**

b. Explain a subgraph of a directed graph G (V, E). Give one example. Draw the directed graph of G (V, E), where V (G) = {A, B, C, D} and E (G) = {(A, B), (A, C), (B, C), (B, D), (C, C), (D, B)} **(06 Marks)**

c. Let A = {1, 2, 3, 4, 12}. Consider the partial order of divisibility on A. That is, if $a, b \in A$, $a \le b$ iff a/b. Draw the Hasse diagram of the poset $(A, \le)$. **(04 Marks)**

d. Define the equivalence relation. Prove an equivalence relation by considering one example. **(06 Marks)**

7 a. Let G be the group of real numbers under addition and G^1 be the group of +ve numbers under multiplication. Show that the mapping $f: G \rightarrow G^1$, defined by $f(a) = 2^a$ is homomorphism and isomorphism. **(06 Marks)**

b. State and prove Lagrange's theorem. **(08 Marks)**

c. A (3, 8) encoding function $e: B^3 \rightarrow B^8$ defined by e (000) = 0000 0000
e (001) = 1011 1000
e (010) = 0010 1101
e (011) = 1001 0101
e (100) = 1010 0100
e (101) = 1000 1001
e (110) = 0001 1100
e (111) = 0011 0001

Find how many errors will e detect. **(06 Marks)**

8 a. If $\alpha = 001110$ and $\beta = 011011$ find:
  i) Weight of α and β
  ii) Distance between α and β. **(10 Marks)**

b. Given a ring $(R, +, \bullet)$, for all $a, b \in R$. Prove the following:
  i) $-(-a) = a$
  ii) $a(-b) = (-a) = -(ab)$
  iii) $(-a)(-b) = ab$. **(10 Marks)**

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06CS35

Third Semester B.E. Degree Examination, December 2011
Data Structures with C

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 pointer? What are the differences between pass by value and pass by reference? **(05 Marks)**

b. Explain the lvalue and rvalue, with examples. **(05 Marks)**

c. Write a C program to search an element, using the binary search (store the elements in an array using pointers) . **(10 Marks)**

2 a. What is a string? Explain the different string handling functions. **(05 Marks)**

b. Write approximate structure definition and variable declarations to store following information about 50 students:

Name, USN, Gender and Marks in the three subjects m_1, m_2 and m_3.

Find the average of the best of two subject's marks. **(08 Marks)**

c. Explain the three file status functions available in 'C' language. **(07 Marks)**

3 a. Define stack. Write a C program to simulate the stack operations. **(08 Marks)**

b. Write an algorithm to evaluate post fix expression. **(05 Marks)**

c. Write a C function to convert prefix to postfix expression. **(07 Marks)**

4 a. What is recursion? Write a recursive function for computing n^{th} term of a Fibonacci sequence. Hence give the trace of stack contents for n = 3. **(10 Marks)**

b. What are the advantages of circular queue? Write a C program to implement circular queue, using an array. **(10 Marks)**

PART – B

5 a. Write a C program to concatenate two singly linked lists. **(04 Marks)**

b. Write a C program to perform the operation on queue, using the singly linked list. **(10 Marks)**

c. Write a C function to insert a node at the specified position. **(06 Marks)**

6 a. Write a C program to perform the following operations, on a doubly linked list:

i) To delete a node whose info field is specified.

ii) To display all the elements in reverse order. **(10 Marks)**

b. Explain the following, using suitable diagrams:

i) Circular list ii) Doubly linked list **(10 Marks)**

7 a. Write a C function to find the maximum value of a tree BST. **(05 Marks)**

b. What is binary tree? Explain. **(05 Marks)**

c. Write a C program to construct BST and traversing of it. **(10 Marks)**

8 a. Explain : i) Binary search tree ii) Threaded binary tree iii) Strictly binary tree iv) Expression tree. **(08 Marks)**

b. Write a C program that accept a pointer to a binary tree and a pointer to a node of the tree and returns the level of the node, in the tree. **(06 Marks)**

c. Construct a binary tree for the expression: $((7 + (8 - 3) * 6) \wedge 5 + 4)$. **(06 Marks)**

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06CS36

Third Semester B.E. Degree Examination, December 2011
UNIX and Shell Programming

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO Questions, from each part.***

PART – A

1 a. Describe the salient features of UNIX operating system. **(08 Marks)**
b. With the help of a diagram, explain the UNIX file system. **(06 Marks)**
c. Explain briefly absolute pathname and relative pathnames with examples. **(06 Marks)**

2 a. Which command is used for listing file attributes? Briefly describe the significance of each field of the output. **(08 Marks)**
b. What are file permissions? How do you use Chmod to set the permissions in a relative manner? **(08 Marks)**
c. Briefly explain S(Substitute) command in ex mode of a Vi editor. **(04 Marks)**

3 a. What are wild cards? Explain the shells wild cards with example. **(08 Marks)**
b. Explain the command 'PS'. Discuss different options used by 'PS'. **(08 Marks)**
c. What are environment variables? Explain any three. **(04 Marks)**

4 a. What are hard links? Explain 'Ln' command. **(06 Marks)**
b. Explain briefly the significance of read, write and execute permission for a directory. **(06 Marks)**
c. Explain the sort command. Briefly discuss the important sort options. **(08 Marks)**

PART – B

5 a. What is grep? Explain any three options and grep with example. **(06 Marks)**
b. What are extended regular expressions? Explain any four ERE set used by grep and egrep. **(08 Marks)**
c. Briefly explain the different ways of addressing used in sed, with example. **(06 Marks)**

6 a. Explain the significance of special parameters used by shell. **(08 Marks)**
b. How test can be used to test the file permission? Write a shell script to check whether a file has executable permission or not. **(06 Marks)**
c. Explain the usage of 'expr' command in shell programming. **(06 Marks)**

7 a. Write the syntax of awk instruction. Explain with example. **(06 Marks)**
b. With respect to awk, explain the following with example : i) NR and NF ii) index iii) Split iv) length v) system. **(10 Marks)**
c. Explain associative arrays in awk. **(04 Marks)**

8 a. Explain the use of chop function in perl programming. Write a perl program which accepts user name and displays it with a greeting message. **(08 Marks)**
b. Briefly discuss about lists and arrays in perl. **(06 Marks)**
c. Explain the following, with respect to perl i) for each ii) split. **(06 Marks)**

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MATDIP301

Third Semester B.E. Degree Examination, December 2011

Advanced Mathematics - I

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Express $\frac{1}{(2+i)^2} - \frac{1}{(2-i)^2}$ in the form $a+ib$. **(06 Marks)**

b. Find the modulus and amplitude of $\frac{(3-\sqrt{2}i)^2}{1+2i}$. **(07 Marks)**

c. Find the real part of $\frac{1}{1+\cos\theta + i\sin\theta}$. **(07 Marks)**

2 a. Find the n^{th} derivative of $\cos x \cos 2x \cos 3x$. **(06 Marks)**

b. If $y = (\sin^{-1} x)^2$, show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2 y_n = 0$. **(07 Marks)**

c. Find the nth derivative of $\frac{x+2}{x+1} + \log\left(\frac{x+2}{x+1}\right)$. **(07 Marks)**

3 a. State and prove Euler's theorem. **(06 Marks)**

b. Given $u = \sin\left(\frac{x}{y}\right)$, $x = e^t$, $y = t^2$, find $\frac{du}{dt}$ as a function of t. **(07 Marks)**

c. If $x = r\cos\theta$, $y = r\sin\theta$, find $\frac{\partial(x,y)}{\partial(r,\theta)}$ and $\frac{\partial(r,\theta)}{\partial(x,y)}$. **(07 Marks)**

4 a. Find the angle of intersection of the curves $r = a(1+\cos\theta)$ and $r = b(1-\cos\theta)$. **(06 Marks)**

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

c. Expand $e^{\sin x}$ by Maclaurin's series upto the term containing x^4. **(07 Marks)**

5 a. Obtain the reduction formula for $I_n = \int_0^{\pi/2} \sin^n x \, dx$ where n is a positive integer. **(06 Marks)**

b. Evaluate : $\int_1^5 \int_1^{x^2} x(x^2+y^2)\,dx\,dy$. **(07 Marks)**

c. Evaluate : $\int_0^1 \int_0^2 \int_1^2 x^2 yz \, dx\, dy\, dz$. **(07 Marks)**

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.

6 a. Prove that $\beta(m,n) = \dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. **(06 Marks)**

b. Show that $\Gamma(n) = \int_0^1 \left(\log \dfrac{1}{x}\right)^{n-1} dx$. **(07 Marks)**

c. Express $\int_0^{\pi/2} \sqrt{\tan\theta}\, d\theta$ in terms of Gamma function. **(07 Marks)**

7 a. Solve : $\dfrac{dy}{dx} = \dfrac{x(2\log x + 1)}{\sin y + y\cos y}$. **(06 Marks)**

b. Solve : $(1 + e^{x/y})dx + e^{x/y}\left(1 - \dfrac{x}{y}\right)dy = 0$. **(07 Marks)**

c. Solve : $(x^2 - ay)dx = (ax - y^2)dy$. **(07 Marks)**

8 a. Solve : $\dfrac{d^4y}{dx^4} + 8\dfrac{d^2y}{dx^2} + 16y = 0$. **(06 Marks)**

b. Solve : $(D-2)^2 y = 8(e^{2x} + \sin 2x)$. **(07 Marks)**

c. Solve : $(D^3 + 4D)y = \sin 2x$. **(07 Marks)**

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