

Department of Computer Science

UNIVERSITY COLLEGE OF ENGINEERING, OU

University College of Engineering, OU

CSE 1st Class test I

Subject: Environmental Science

Test Duration: 1 Hour

Maximum Marks: 20

PART-A (4X2 = 8 marks) Note: Answer All Questions

1. What is water logging
2. Define soil salinity
3. Describe the floods & draught.
4. How many different water sources are there?

PART-B Descriptive (2X6 = 12 marks) Note: Answer Any Two Questions

5. Write about the forest ecosystem.
6. Write the benefits and problems of Dams.
7. Write environmental effects with modern Agricultural practice, emphasize on synthetic Fertilizers and Pesticides.

Department of Computer Science & Engineering
University College of Engineering(A), O. U. Hyderabad-07.

Department of Computer Science & Engineering
University College of Engineering(A), O. U, Hyderabad-07.

Internal Examination – I

Class : B.E III Sem

Subject : Data Structures

Time : 1 hour

Max. Marks : 20

PART - A

Answer ALL Questions

$3 \times 2 = 6$ marks

1. What is a Toeplitz matrix? Give an example.
2. Give the prefix form of the expression $A+B^* (C+D)/(P+R)$.
3. Define Insertion sort with an example.

PART - B

Answer any TWO Questions

$2 \times 7 = 14$ marks

4. a) Write a procedure to concatenate two singly linked lists.
b) Give an algorithm to reverse a singly linked list.
5. Explain the application of stack for conversion of infix to postfix with an algorithm and example.
6. Explain the following sorting techniques with an algorithm and example.
a) Quick sort b) Merge sort

Department of Computer Science & Engineering
University College of Engineering(A), O. U, Hyderabad-07.

**Class : B.E III- Sem
Subject : LST**

Internal Examination – I

**Time : 1 hour
Max. Marks : 20**

Answer any FOUR Questions (4 x 5 = 20 marks)

- 1) a) Simplify the following expression : $ABC'D + AB'C'D + A'BCD + AB'CD + A'B'CD'$ (3)
b) Which gate is considered as odd input/output function and why? (2)
- 2) Boolean expression for $F(A,B,C,D) = \sum_{\text{m}}(3,5,7,8,10,11,12,13)$ (5)
- 3) For the given function $F(w,x,y,z) = \sum_{\text{m}}(0,1,2,4,5,7,11,15)$ (5)
(a) Show the map
(b) find all prime implicants and indicate which are essential
- 4) The following Boolean expression: $BE + B'DE'$ is a simplified version of the expression:
 $A'B'E + BCDE + BC'D'E + A'B'DE' + B'C'DE'$ are there any don't care conditions?
If so what are they? (5)
- 5) Implement the following function with NOR gates. Assume that both the normal and complement inputs are available. (5)

$$AB' + C'D + A'CD' + DC'(AB + A'B') + DB(AC' + A'C)$$

Department of Computer Science and Engineering
University College of Engineering (Autonomous)
OSMANIA UNIVERSITY – HYDERABD 500 007

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BE (ECE) III Semester 2017-18 Time: 1hr

SUB: BASIC ELECTRONICS ENGGINERING

Marks:20

PART-A(Answer all) 3*2= 6M

1. Derive the relationship between α and β .
2. Show that the maximum efficiency of half wave rectifier is 40.6%.
3. Distinguish between zener and avalanche breakdown.

PART-B(Answer Any two) 2*7=14M

1. Explain full wave Bridge rectifier circuit with its wave form Derive ripple factor, average current and voltage, RMS current and voltage, PIV,TUF,efficiency.
2. Explain input and output characteristics of CE configuration with neat sketch.
3. Explain Drain and static characteristics of JFET with neat sketch.

Department of Computer Science & Engineering
University College of Engineering(A), O. U, Hyderabad-07.

Internal Examination – I

Class : B.E III Sem

Subject : Discrete Mathematics

Time : 1 hour

Max. Marks : 20

PART - A

Answer ALL Questions

$3 \times 2 = 6$ marks

1. Using the statements

R : Mark is rich

H : Mark is happy

Write the following statements in symbolic form

- a) Mark is poor but happy
b) Mark is poor or he is both rich and unhappy.

2. Give the power sets of the following.

- a) { X, Y, Z }
b) { a, {b} }

3. What is Isomorphism? Give example.

(2)

(2)

(2)

PART - B

Answer any TWO Questions

$2 \times 7 = 14$ marks

4. a) Obtain the principal conjunctive normal form of the formula S given by ($\neg P \rightarrow R$) \wedge ($Q \leftrightarrow P$) (5)
b) $P(x)$: x is a person

F (x, y) : x is the father of y

M (x, y) : x is the mother of y

Write the predicate " x is the father of the mother of y"

5. a) Determine whether the following inference is valid or faulty. Produce some evidence which will confirm its validity,

The days are becoming longer

The nights are becoming shorter if the days are becoming longer.

Hence, the nights are becoming shorter.

- b) Prove by contra positive : If the product of two integers a and b is even, then either a is even or b is even. (3)

6. a) Write sum of degrees theorem.

(4)

- b) Is there a graph with degree sequence (1, 3, 3, 3, 5, 6, 6) Justify your answer.

(3)

- c) Give example for simple and multi-graph.

(2)

(2)

Department of Computer Science & Engineering
University College of Engineering(A), O. U, Hyderabad-07.

Internal Examination – II

**Class : B.E III Sem
Subject : Data Structures**

Time : 1 hour

Max. Marks : 20

PART - A
Answer ALL Questions

$3 \times 2 = 6$ marks

1. What is a spanning tree? How many edges exist in a minimum spanning tree with 100 nodes?
2. What is a Complete Graph? Give an example.
3. Define B-tree. Give an example.

PART - B
Answer any TWO Questions

$2 \times 7 = 14$ marks

4. a) Explain Heap sort with an example.
b) What are the different representations of graph? Explain.
5. a) Write an algorithm to do the DFS traversal of a graph. Explain with an example.
b) Explain Prim's Algorithm with an example.
6. Write an algorithm for Inserting and Deleting a node from an AVL tree. Explain with an example.

Department of Computer Science & Engineering
University college of Engineering, Osmania university

Subject : Environmental Science

Class : BE III-Sem II Class Test

Time :1 Hour

Marks :20

I Answer ALL the Questions

$4 \times 2 = 8$ marks

5. What do you mean by Endangered species ?
6. Define endemic species
7. Write a short note on Biodiversity conservation
8. Explain about Bio-magnification

II Answer any TWO Questions

$2 \times 6 = 12$ marks

4. Write about the consequences, causes and control measures of Soil pollution
5. Write about the consequences, causes and control measures of Air pollution
6. Write about Air Act 1981

Department of Computer Science & Engineering
University College of Engineering(A), O. U, Hyderabad-07.

Internal Examination – II

Class : B.E III Sem

Subject: Logic & Switching Theory

Time : 1 hour
Max. Marks: 20

PART - A
Answer ALL Questions

3 x 2 = 6 marks

- 1) Implement the following function with a multiplexer:

$$F(A,B,C,D) = \sum(0,1,3,4,8,9,15)$$

- 2) Compare latch with flip-flop.

- 3) Differentiate between PROM, PAL & PLA

PART - B

Answer any TWO Questions

2 x 7 = 14 Marks

- 1) a) Implement a full adder circuit with a decoder and two OR gates.
b) Derive the PLA program table for a combinational circuit that squares a 3-bit number. Minimize the number of product terms.
- 2) a) Elaborate on JK flip-flops and what is the purpose of it.
b) Explain the flip-flops excitation table.
- 3) Derive a combinational logic circuit for comparison of two numbers is an operation that determines if one number is greater than , less than or equal to other number.

Department of Computer Science & Engineering
XI
University College of Engineering(A), O. U, Hyderabad-07.

Internal Examination – II

Class : B.E III Sem

Time : 1 hour

Subject : Discrete Mathematics

Max. Marks : 20

PART - A

Answer ALL Questions

3 x 2 = 6 marks

1. What is Composite Relation?
2. A simple code is made by permuting the letters of the alphabet with every letter being replaced by a distinct letter. How many different codes can be made in this way?
3. In how many ways can a person climb up a flight of n steps if the person can skip at most one step at a time.

PART - B

Answer any TWO Questions

2 x 7 = 14 marks

3. a) From a group of 10 professors how many ways can a committee of 5 members be formed so that at least one of Professor A and Professor B will be included.
b) Let $X = \{1, 2, 3\}$, & f, g, h, & s be functions from X to X given by $f = \{\langle 1, 2 \rangle, \langle 2, 3 \rangle, \langle 3, 1 \rangle\}$, $g = \{\langle 1, 2 \rangle, \langle 2, 1 \rangle, \langle 3, 3 \rangle\}$ $h = \{\langle 1, 1 \rangle, \langle 2, 2 \rangle, \langle 3, 1 \rangle\}$ $s = \{\langle 1, 1 \rangle, \langle 2, 2 \rangle, \langle 3, 3 \rangle\}$
Find $f \circ g$, $g \circ f$ & $f \circ h \circ g$.
4. a) In $(1 + x^5 + x^9)^{10}$ Find the Coefficient of x^{23} .
b) Solve the following recurrence relation by substitution
 $a_n = a_{n-1} + n$ where $a_0 = 2$.
3. a) Let N be the set of natural numbers including zero. Determine the following function is one to one or onto or one-to-one onto.
 $F : N \rightarrow N$ $f(j) = \begin{cases} 1 & j \text{ is odd and } 0 & j \text{ is even} \end{cases}$
b) What is partial ordering, explain with example.

PART-A [ANSWER ALL] $3 \times 2 = 6M$

- ① Define stabilization of gain.
- ② The resonant circuit of a tuned collector transistor oscillator has a resonant frequency of 5MHz. If the value of capacitance is increased by 50%, calculate the new resonant frequency.
- 3). Hybrid parameters for CB amplifier circuit are $h_{11} = 800\Omega$, $h_{21} = 47$, $h_{12} = 5.4 \times 10^{-4}$, $h_{22} = 80\mu\text{mho}$, $R_L = 200\text{k}\Omega$ find voltage gain.

PART-B [ANSWER ANY TWO] $2 \times 7 = 14M$

- ① Describe Hartley oscillator. Determine the frequency of oscillations and the oscillation condition for it.
- 2) Draw the circuit diagram of phase shift oscillator and explain its operation by deriving expression for frequency of oscillation.
- 3). Derive the ~~conversion~~ formulae of common-emitter h-parameters and draw the equivalent circuit.
[Input impedance, voltage gain, current gain, output impedance, A_{vS} , A_{IS}].

DEPARTMENT OF MATHEMATICS
UNIVERSITY COLLEGE OF ENGINEERING (A)-O.U, HYD-7
B.E. (C.S.E) - III-SEMESTER- CLASS TEST -II
MATHEMATICS-III

Time: 1 Hour

Max Marks: 20

$$4 \times 2 = 8$$

PART-A

Answer all the questions

1. Show that the function $f(z) = \sqrt{|xy|}$ is not differentiable at $z = 0$.

2. Evaluate $\oint_c \frac{dz}{1-z}$, where $c : |z| = \frac{1}{2}$.

3. Expand $f(z) = \frac{1}{3-z}$ in the region $|z| > 3$.

4. Find the zeros and singularities of $f(z) = \tan z$.

$$3 \times 4 = 12$$

PART-B

Answer any 3 questions

5. Prove that $u(x, y) = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic. Find its conjugate harmonic function $v(x, y)$ and express $f(z) = u + iv$ in terms of z .

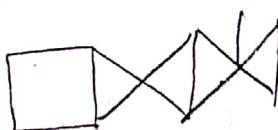
6. Using Cauchy's integral formulae, evaluate

a) $\oint_c \frac{2z^2 + z}{z^2 - 1} dz$, where c is the circle $|z-1|=1$ and

b) $\oint_c \frac{e^z}{z^2(z+1)^2} dz$, where c is the circle $|z+1|=\frac{1}{2}$.

7. Evaluate $\int_0^{2\pi} \frac{d\theta}{2 - \cos\theta}$ using residue theorem.

8. Find the bilinear transformation which maps the points $z = 0, -1, i$ into $w = i, 0, \infty$. Hence find the image of the unit circle $|z| = 1$.



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OSMANIA UNIVERSITY
FACULTY OF ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)
B.E. (EEE, ECE & CSE) III-Semester (Main) Examination
November/December 2018
ENVIRONMENTAL SCIENCES

Max. Marks: 70

Time: 3 hours

Note: i) First Question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) Missing data, if any, may suitably be assumed.

1. a) Define water logging. [1]
b) Write a short note on Decomposers. [2]
c) Describe with examples the lentic aquatic ecosystem. [2]
d) Classify the energy sources and give the examples for each of them. [3]
e) Define extinct species and write one example of it. [2]
f) What is thermal pollution? [2]
g) Write the consequence of global warming [2]
2. a) "If floods are managed efficiently then drought can also be controlled." - Justify the statement. [6]
b) Write the effects of modern agricultural Techniques. [4]
c) Write the different reasons for scarcity of drinking water. [4]
3. a) Explain in detail about different reasons for land degradation. [6]
b) Explain the structure and function of forest ecosystem with diagram. [6]
c) Write a short note on soil erosion. [2]
4. a) Write Bio geo classification of India. [6]
b) What are the different threats to biodiversity? [3]
c) Explain the different techniques of Biodiversity Conservation with examples. [4]
d) Define Endemic species [1]
5. a) Write the causes, effects and control measures of air pollution. [6]
b) Write a detailed account on wild life protection Act 1972. [6]
c) Write a short note on Noise pollution. [2]

6. a) Explain the impacts of climate change with special reference to acid rains, Ozone layer depletion [7]
- b) Write the different types of disasters and explain the impacts of it [7]
7. a) Explain the different effective methods of solid waste management. [6]
- b) Define 'Endangered species', with examples. [2]
- c) Explain the biotic components in the ecosystem with reference to producers, consumers and decomposers. [4]
- d) Define 'Soil salinity'. [2]

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OSMANIA UNIVERSITY
FACULTY OF ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)
B.E. (CSE) III-Semester (Main) Examination
November/December 2018

LOGIC AND SWITCHING THEORY.

Time : 3 hours

Max. Marks : 70

- Note : i) First Question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) Missing data, if any, may suitably be assumed.
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1. a) Simplify the algebraic expression: $x' + y' + xyz'$. [2]
- b) When a prime implicant p of a function f is said to be an essential prime implicant. [2]
- c) Construct a 64 – to -1 multiplexers using 8 x 1 multiplexers. [3]
- d) Distinguish between Synchronous and asynchronous sequential circuits. [1]
- e) What is programmable logic array? How it differs from ROM? [3]
- f) Distinguish between Mealy and Moore with Examples. [3]
2. a) Determine the canonical sum-of-products representation of the functions: [9]
 - i) $F(x, y, z) = z + (x' + y)(x + y')$
 - ii) $F(x, y, z) = x + (x'y' + x'z)'$
- b) With the aid of a k-map derive minimal sum of products expressions for the function $F(w, x, y, z) = \sum(0, 2, 4, 5, 6, 8, 10, 12)$ [5]
3. a) Use the tabulation procedure to generate the set of prime implicants and to obtain all minimal expressions for the given function
 $F(w, x, y, z) = \sum(0, 1, 5, 7, 8, 10, 14, 15)$ [7]
- b) Draw the circuit that has three inputs X1, X2 and X3 which produce an output value of 1, whenever two or more of the input variables have the value 1, otherwise the output has be 0. [7]
4. a) Design the combinational circuit that generates the 9's complement of a BCD-digit. [7]
- b) Design a BCD to Excess -3 code converter and realize with minimum number of gates. [7]
5. a) Design and explain a 32×8 ROM. [8]
- b) Implementation of JK and T flipflops using D flipflop. [6]

6. a) A sequential circuit has two D = type Flip-Flops, an input X and an output Y. [7]

It can be specified by the following equation

$$D_A = AX + BX$$

$$D_B = A'X$$

$$Y = (A+B) X'$$

$$Y = (A+B) X'$$

- b) Design BCD counter using JK-Flip-flop. [7]

7. a) Draw the diagram for 3-bit shift register and explain its operation. [5]

- b) Design the following circuits: [9]

a) Priority Encoder

b) Subtractor

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OSMANIA UNIVERSITY
FACULTY OF ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)
B.E. (CSE) III-Semester (Main) Examination

November/December 2018

DISCRETE MATHEMATICS.

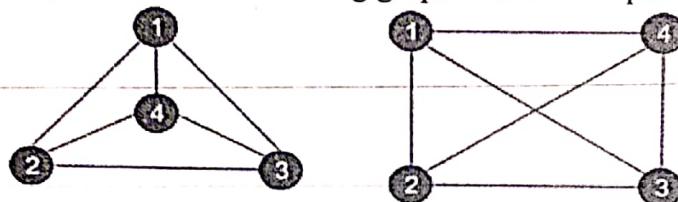
Max. Marks : 70

Time : 3 hours

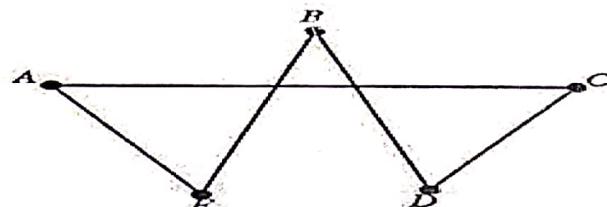
- Note :**
- i) First Question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.
 - ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
 - iii) Missing data, if any, may suitably be assumed.
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1. a) Write the following statement in symbolic form. [2]
“The crop will be destroyed if there is a flood”
- b) Symbolize the statement “All men are giants”. [2]
- c) A simple code is made by permuting the letters of the alphabet with every letter being replaced by a distinct letter. How many different codes can be made in this way? [2]
- d) Write a generating function for a_r when a_r is the number of ways of selecting r balls from 3 red balls, 5 blue balls, 7 white balls. [2]
- e) Define homomorphism. [2]
- f) What is in degree and out degree of a graph? [2]
- g) Define Tree. [2]
2. a) Let $p(x):x$ is a person [3]
 $F(x,y):x$ is the father of y
 $M(x,y):x$ is the mother of y
Write the predicate “ x is the father of the mother of y ”
- b) Give the powersets of the following [6]
(i) $\{a, \{b\}\}$ (ii) $\{1, \emptyset\}$ (iii) $\{X, Y, Z\}$
- c) If a and b are odd integers, then $a+b$ is an even integer. Give direct proof. [5]
3. a) Suppose that 200 faculty members can speak French and 50 can speak Russian, while only 20 can speak both French and Russian. How many faculty members can speak French or Russian? [6]

- b) What is composite relation? Let $R = \{<1, 2>, <3, 4><2, 2>\}$ and [8]
 $S=\{<4, 2>, <2, 5>, <3, 1>, <1, 3>\}$ Find
 RoS, SoR, Ro(SoR), (RoS)oR, RoR, SoS and RoRoR?
4. a) Find the coefficient of x^{20} in $(x^3 + x^4 + x^5 + \dots)^5$. [7]
- b) Solve the recurrence relation by substitution.
 $a_n = a_{n-1} + n$ where $a_0 = 2$ [7]
5. a) Write the conditions of a Group and Subgroup. [7]
- b) Write Fermat's theorem [7]
6. a) Define Isomorphism .Is the following graphs are Isomorphic or not [8]



- b) What is spanning tree? Find a Hamiltonian cycle in the following graph. [6]



7. a) Write the First theorem of Graph theory. [7]
- b) Construct the truth table for $(P \rightarrow Q) \wedge (Q \rightarrow P)$. [7]

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OSMANIA UNIVERSITY
FACULTY OF ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)
B.E. (CSE) III-Semester (Main) Examination
November/December 2018

BASIC ELECTRONICS ENGINEERING

Max. Marks : 70

Time : 3 hours

Note :

- i) First Question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.
- ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
- iii) Missing data, if any, may suitably be assumed.

1. a) In a Common Emitter transistor circuit if $\beta = 100$ and $I_B = 50\mu A$, compute the values of α , I_E and I_C . [2]
- b) What is expression for ripple factor when capacitor filter is used with half wave rectifier? [2]
- c) Why RC oscillators are not used at High Frequencies. [2]
- d) Define Q-Point. [2]
- e) Draw the simplified h-parameter model of a Bipolar Junction Transistor. [2]
- f) Differentiate between Avalanche and Zener breakdowns. [2]
- g) Write CRO applications. [2]
2. a) Draw FWR and explain operation with neat sketch, Derive the expressions for PIV, Ripple factor, Conversion Efficiency and TUF of a Full wave rectifier. [9]
- b) A sinusoidal voltage of amplitude 20V, 50Hz is applied to a half wave rectifier. If $R_L = 1000\Omega$, $R_f = 10\Omega$, $R_r = \infty$, Find the values of (i) Conversion Efficiency (ii) Ripple factor (iii) Percent Regulation [5]
3. a) Draw the exact h parameter model of a Transistor suitable for CE configuration. Derive expressions for voltage gain, current gain, input impedance and output impedance of an amplifier using exact h parameter model. [10]
- b) Explain the VI characteristics of PN-junction diode. [4]
4. a) Explain how Op-Amp can be used as [7]
 - i) Integrator
 - ii) Inverting Summer and
 - iii) Voltage Follower
- b) Design Full Adder and Implement it using two half adders. [7]

5. a) Derive an expression for frequency of oscillation of a RC Phase shift [10] oscillator.
- b) What is an oscillator? Derive necessary condition for the oscillator to [4] produce oscillations.
6. a) Explain the operation of a Field effect Transistor. Derive an expression for [10] pinch-off voltage of a FET.
- b) Compare BJT and FET. [4]
7. a) Explain the operation of photodiode, LED. [7]
- b) Explain the Construction and characteristics of SCR, UJT. [7]

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OSMANIA UNIVERSITY
FACULTY OF ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)
B.E. (Civil,EEE,ECE,MECH.,CSE) III-Semester (Main) Examination
November/December 2018
MATHEMATICS-III

Time : 3 hours**Max. Marks : 70**

- Note:* i) First Question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.
ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
iii) Missing data, if any, may suitably be assumed.
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1. a) Find the values of a, b, c, d such that the function [2]
 $f(z) = x^2 + axy + by^2 + i(cx^2 + dxy + y^2)$ is analytic.

- b) Determine the singular points of $f(z) = \frac{z^3 + z}{(z-1)^2(z+2)}$ and classify [3] them.

- c) Find the half range sine series of the function $f(x) = x$ in $[0, \pi]$. [3]

- d) Form a partial differential equation by eliminating the arbitrary [3] constants a, b from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.

- e) Solve $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$, $u(x, 0) = 4e^{-x}$ by the separation of variables [3] method.

2. a) Show that the function $v(x, y) = y + 3x^2y - y^3$ is harmonic. Find [8] the corresponding conjugate harmonic function $u(x, y)$ and construct the analytic function $f(z) = u + iv$.

- b) State Cauchy's integral theorem and verify it for $\oint_C z^2 dz$, where C is [6] the boundary of the square with vertices at $-1-i, 1-i, 1+i, -1+i$.

3. a) Using residue theorem , evaluate i) $\oint_c \frac{2z+1}{(2z-1)^2} dz$, where c is [7]
 $|z|=1$ and ii) $\oint_c \frac{3z^2+2}{(z-1)(z^2+9)} dz$, where c is $|z-2|=2$.

- b) Find the bilinear transformation which maps the points $1, i, -1$ in the $[7]$
 $z-plane$ to the points $i, 0, -i$ in the $w-plane$ respectively. Hence
find the image of $|z| < 1$.

4. a) Obtain the Fourier series for the function $f(x) = x^3$ in $[-1, 1]$. [6]

- b) Find the Fourier series expansion for the function [8]
 $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$ and deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$

5. a) Find the general solution of the Lagrange equation [6]
 $2xzp + 2yzq = z^2 - x^2 - y^2$.

- b) Solve $(D^2 - D'^2) z = \cos(x+y)$. [8]

6. a) Solve [6]

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad u(0, t) = u(1, t) = 0, \quad u(x, 0) = 3 \sin \pi x, \quad 0 < x < 1, \quad t > 0$$

- b) A tightly stretched string of length l with fixed ends is initially in equilibrium position. If it is set vibrating by giving each point a velocity $\sin^3\left(\frac{\pi x}{l}\right)$, find the displacement. [8]

7. a) Show that for the function $f(z) = \sqrt{|xy|}$, the Cauchy-Riemann equations are satisfied at $z=0$ but $f'(0)$ does not exist. [8]

- b) Transform $x^2 p^2 + y^2 q^2 = z^2$ to $F(p, q) = 0$ form and hence solve it. [6]

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