

Institute of Information Technology

Jahangirnagar University

2nd Part 2nd Semester B.Sc.(Hons) Final Examination 2017

Course Code: IIT 2207

Course Title: Ordinary and Partial Differential Equations

Time: 3 Hours

Full Marks: 60

Answer any Five (05) from the following questions:

All parts of a particular question must be answered consecutively

- 1(a) Define order and degree of a differential equation. Write an ordinary differential equation of order 2 and degree 3. 3
- (b) Solve: $y \sin 2x \, dx - (y^2 + \cos^2 x) dy = 0$ 4
- (c) Solve: $(x + y)^2 dx - (y^2 - 2xy - x^2) dy = 0$ 5
- 2(a) Define exact differential equation. 4
- Solve: $(e^y + 1) \cos x \, dx + e^y \sin x \, dy = 0$
- (b) Solve: $(D^3 + 2D^2 - D - 2)y = e^x + x^2$ 4
- (c) Solve: $(x^2 D^2 - xD + 2)y = x \log x$ 4
- 3(a) Solve the simultaneous differential equations: $\frac{dx}{dt} - 7x + y = 0$ 7
- $\frac{dy}{dt} - 2x - 5y = 0$
- (b) Show that $x^3 \frac{d^3 y}{dx^3} = D(D-1)(D-2)y$ where $D \equiv \frac{d}{dx}$ 5
- 4(a) Define PDE. Form a partial differential equation from $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ 6
- (b) Solve: $xzp + yzq = xy$ where $p = \frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$ 6
- 5(a) Define Laplace transformation. Write down linear property, shifting property and change of scale property of Laplace transformation with examples of each one. 6
- (b) Calculate the value of $L\{e^{-t} \cos 2t\}$. 6
- 6(a) Find the Fourier cosine and sine transformations of e^{-bx} and evaluate the integral $\int_0^\infty \frac{\cos ax}{a^2 + b^2} da$ 6
- (b) Find the Fourier series expansion of the function, $f(x) = \begin{cases} 0, & -\pi < x \leq 0 \\ x, & 0 < x \leq \pi \end{cases}$ 6
- Hence evaluate the sum $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}$
- 7(a) Find $L^{-1}\left(\frac{3s+1}{(s-1)(s^2+1)}\right)$ 4
- (b) Solve: $(D^2 - 4)y = \sin 2x + \cos^2 x$ 4
- (c) Solve: $(D^3 - 4D^2 + 5D - 2)y = 0$ 4

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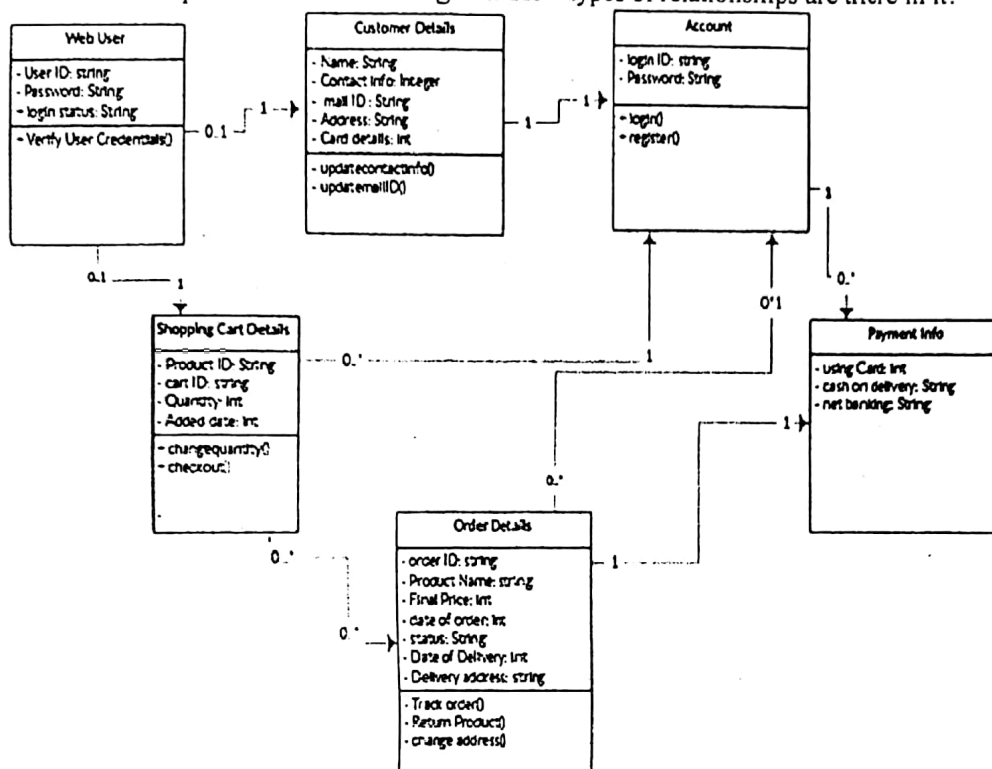


Course Code: IT-2201
Total Marks: 60

Course Title: Information System Analysis
Times: 3 Hours

Answer any five (5) questions:

1. a) Write down the process of use case diagram? How types of relationships are there in it? 4.0



- b) Considering the above class diagram of online shopping, identify business actor and business requirements use cases. 4.0
- c) Considering the above situation, construct use case model diagram. 4.0
2. a) Assume that you are given the following details of a small mail order catalogue system that allows people to shop from home: 8.0
When a customer receives the catalogue and wants to buy something, he can telephone, fax or email his order to the company. The company gets the order and sends the goods and an invoice. When the customer receives the goods with a delivery note, he sends payment and receives a receipt for payment. Draw the context diagram and data flow diagrams up to level 2 to analyze the requirements of this system. Also, give the data dictionary.
- b) Distinguish between technical and economical feasibility studies. 4.0
3. Suppose you want to build an information system for hospital which is hospital management software. This software designed to manage all aspects of hospital operations i.e. Outpatient and Inpatient management, Patient registration, Doctor appointment and Medical billing. Now, you are discovering the requirements from your client for developing an information system based on above scenario.
- a) What is requirements discovery? Identify appropriate requirement discovery techniques for the above situation. 1+5
- b) What would be input design and output design for the above situation? 6.0
4. Railway Reservation System is a system used for booking tickets over internet. Any Customer Can book tickets for different trains. Customer can book a ticket only if the tickets are available. Customer searches for the availability of tickets then if the tickets are available he books the tickets by initially filling details in a form. Tickets can be booked in two ways by i-ticket or by e-ticket booking.

In case of i-ticket booking customer can book the tickets online and the tickets are couriered to Particular customer at their address. But in case of e-ticket booking and cancelling tickets are booked and cancelled online sitting at the home and customer himself has to take print of the

ticket but in both the cases amount for tickets are deducted from customers account.

For cancellation of ticket the customer has to go at reservation office than fill cancellation form and ask the clerk to cancel the ticket than the refund is transferred to customer account. After booking ticket the customer has to checkout by paying fare amount to clerk.

- Write the n
miss
- a) Draw a class diagram considering above situation. 4.0
b) Draw a sequence diagram for bookstore checkout system. 4.0
c) Draw an activity diagram for bookstore checkout system. 4.0
5. a) Answer the following questions: 5.0
i. Write down the name of stakeholders
ii. Write down the name of system process
iii. Write down name of information system
iv. Write down the name of business driver
v. Write the name of technology driver
- b) What do you mean by CASE tools and ADEs? Briefly describe these two automated tools and technology. 3.0
c) What is information system? Who are the most important stakeholders in an information system? What types of skills needed by these roles? 4.0
6. a) Systems Analyst Salaries Situation: As part of your job search, you decide to find out more about salaries and qualifications for systems analysts in the area where you would like to work. To increase your knowledge, search the Internet to perform the following research: 6.0
i. Find information about a career as a systems analyst.
ii. Using the Internet, determine whether the Federal Bureau of Labor Statistics lists salary information for systems analysts. If so, summarize the information you find.
iii. Find at least two online ads for systems analysts and list the employers, the qualifications, and the salaries, if mentioned.
iv. Find at least one ad for an IT position that specifically mentions e-commerce.
b) What is meant by system testing? Explain different types of system testing. 4.0
c) What is meant by cohesion and coupling in design solution? 2.0
7.

```
public class Car {
    private String model;
    public void printPrice() {
    }
    public String getModel() {
        return model;
    }
    public void setModel(String model) {
        this.model = model;
    }
}

public class Hatchback extends Car {
    private String model;
    public void printPrice() {
        System.out.println("Hatchback Price");
    }
    public String getModel() {
        return model;
    }
    public void setModel(String model) {
        this.model = model;
    }
}
```
- a) Considering the above program, Draw a UML Class Diagram. 4.0
b) i. Class A implements the interface B. Represent this in UML. How would you implement this relationship in java? 4.0
ii. Class A extends the class B. Represent this in UML. How would you implement this relationship in java?
c) What do you mean by illegal data flow? Give some example of illegal data flow and correct them. 4.0

$f(x)$



Institute of Information Technology
Jahangirnagar University
2nd Part 2nd Semester Final Examination 2017
Course Code; 2203 Title: Digital Logic Design
Total Marks 60; Time 3 hours

Answer any 5 Questions:

- 1 a) Define maxterm and minterm. 2
b) Simplify the logic circuit shown in Figure 1 3

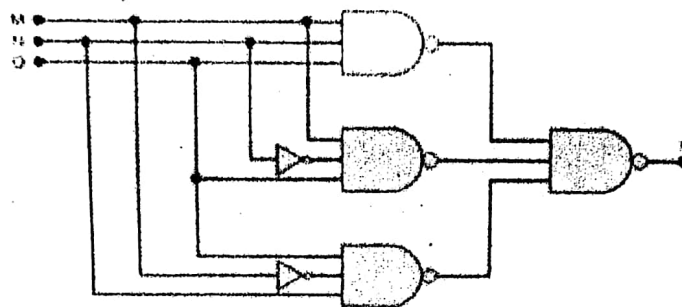


Figure 1: Question # 1 (b)

- c) For the combinational logic circuit shown below: 5
- Obtain the Logic Equation directly from the schematic
 - Obtain SOP using Boolean theorems & postulates
 - obtain the Truth Table
 - obtain the Canonical form SOP
 - obtain the Minterm representation

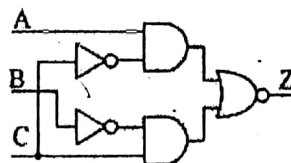


Figure 2: Question # 1 (c)

- d) Use a K map to simplify $y = \bar{C}(\bar{A}\bar{B}\bar{D} + D) + A\bar{B}C + \bar{D}$ 2
- 2 Proof the following Theorems: 3
- $x+x=0, x.x=x$ 3
 - $(x+y)=xy$ 3
 - Draw the EXOR and EXNOR Gates and explain the working logics with the truth table. 3
 - Prove that NOR is gate Universal Logic gate. 3

$$f(x) = \begin{cases} 0, & -\pi < x < \pi \\ x, & \text{otherwise} \end{cases}$$

What are the important parameters of IC logic family?

- b) Define: Fan-out, Propagation delay, Noise Margin 3
- c) Draw a 1 bit memory cell basic FF with NAND and NOR gates \rightarrow SR flip flop 3
- b) Draw the IC-7404 and 7400 internal design with gates. 3
- 4 a) Design 1 to 4 line MUX and DeMUX 4
- b) Simplify the following terms: 4
- i) $F = ABC + ABC' + AB'C$ 4
- ii) $F = A'C(A'BD)' + A'BC'D' + AB'C$ 4
- 5 a) Why Karnaugh Map is important in digital logic design? 2
- b) When you should use Quine-McCluskey method? 2
- c) Represent the following function into K-Map: 4
- $$F = A'B'CD + A'BC'D + AB'C'D + ABCD' + AB'C'D' + ABCD$$
- d) $F = (ABCD) = (0, 1, 3, 7, 8, 12) + dc(5, 10, 13, 14)$ 4
- e) Why cell changes occurs like 01 then 11 not 10 in K-Map? 2
- 6 a) Define the combinational circuit with block diagram. 2
- b) What are the steps involved with designing combinational circuit? 2
- c) Implement a Full adder circuit with half adder circuit. 4
- d) Design and draw a 3 to 8 line Decoder. 4
- 7 a) Define different types of clock signal with figures. 2
- b) Draw and explain the operation of a Clocked J-K Flip-flop 4
- c) Distinguish between D and T FFs 3
- d) Determine the Q waveform for the Figure 3 3

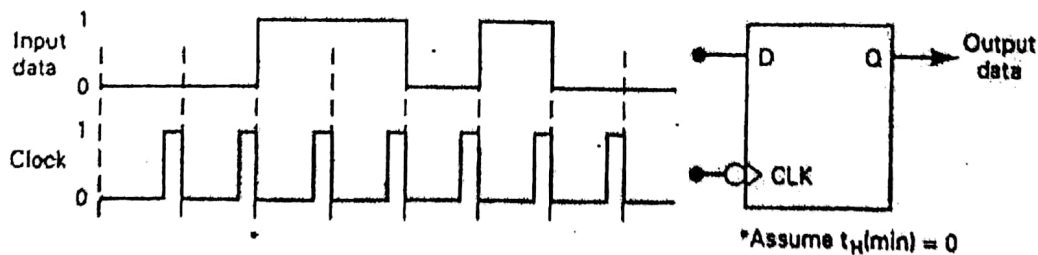


Figure 3: Question # 7 (d)



Institute of Information Technology
JAHANGIRNAGAR UNIVERSITY
2nd Year 2nd Semester Final Examination 2017

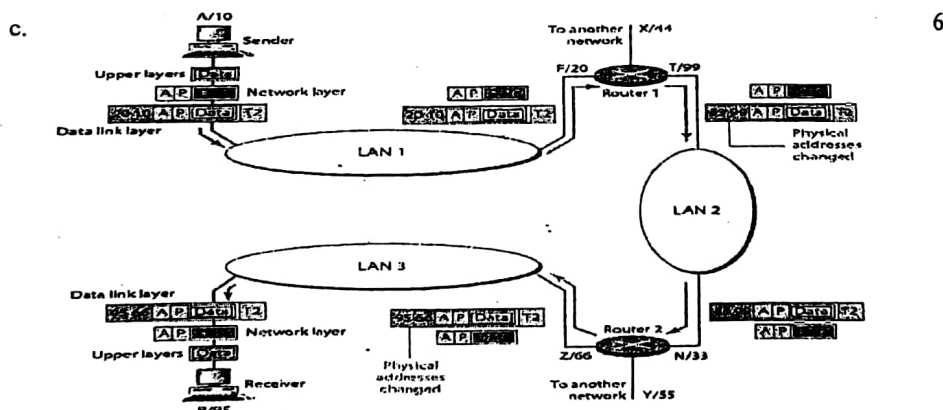
Duration: 03 Hr
Course Code: IT 2205

Full Marks: 60
Course Title: Data Communication

There are seven questions, answer any five of them. Figures in the right margin indicates the marks

1. a. What is protocol? Briefly describe about the elements of a protocol. 4
 b. For each of the following four network, discuss the consequences if a connection fails: 4
 i) Seven devices arranged in a mesh topology
 ii) Seven devices arranged in a star topology (not counting the hub)
 iii) Seven devices arranged in a bus topology
 iv) Seven devices arranged in a ring topology.
 c. Performance is inversely related to delay. When we use the Internet, which of the following applications are more sensitive to delay? Justify your answer. 4
 i) Sending an e-mail
 ii) Copying a file
 iii) Surfing the Internet.

2. a. Suppose transmission channels become virtually error-free. Is the data link layer still needed? Why? 3
 b. Suppose two Ethernet LANs are interconnected by a box that operates as follows. The box has a table that tells it the physical addresses of the machines in each LAN. The box listens to frame transmissions on each LAN. If a frame is destined to a station at the other LAN, the box retransmits the frame onto the other LAN, otherwise the box does nothing. Is the resulting network still a LAN? Does it belong in the data link layer or the network layer? Justify your answer. 3



The above figure shows a part of an internet with two routers connecting three LANs. Each device (computer or router) has a pair of addresses (logical and physical) for each connection. Suppose Host A wants to send a packet to Host P. Considering the physical addresses and logical addresses, briefly describe the change of address headers in each node that must happen before reaching to the final destination.

3. a. What is transmission impairment? Briefly describe three types of transmission impairment. 6
 b. i. What is the total delay for a frame of size 5 million bits that is being sent on a link with 10 routers each having a queuing time of $2 \mu s$ and a processing time of $1 \mu s$. The length of the link is 2000 Km. The speed of light inside the link is 2×10^8 m/s. The link has a bandwidth of 5 Mbps. 4
 ii. Which component of the total delay is dominant and why?
 c. A file contains 2 million bytes. How long does it take to download this file using a 1-Mbps channel? 2
4. a. What is line coding? Why is it needed? 4
 b. Draw the line codes of Manchester and NRZ-I for the bit stream 3
 11001010

The first bit is the left most bit

- c. Define self-synchronization. List two line codes which have this property. 2
- d. Draw a block diagram of a Quadrature Phase Shift Keying (QPSK) modulator and show an example of mapping data bits to symbols on the constellation diagram. 3
5. a. Explain Frequency Division multiplexing and demultiplexing process using suitable diagram. Assume that a voice channel occupies a bandwidth of 4kHz. We need to combine four voice channel into a link starting from channel bandwidth 20kHz. Show the configuration with the use of guard band of 1 kHz. 5
- b. Draw the digital signal hierarchy for the generation of T-1 and E-1 frames. 4
- c. Calculate the data rate for a T-1 and E-1 frames. 3
6. a. A bit stream 10011101 is transmitted using CRC method. The generator polynomial is $x^3 + 1$. Prove that a 2D parity check method can detect 3 errors only. 6
- b. Consider four stations with chip code $C_1 = [+1 +1 +1 +1]$, $C_2 = [+1 -1 +1 -1]$, $C_3 = [+1 +1 -1 -1]$ and $C_4 = [+1 -1 -1 +1]$ respectively. Assume that station 1 and 2 are sending a 0 bit, station 4 is sending 1 bit and station 2 is silent. Prove that station 4 can get data sent by station 2 if it multiplies that entire data on the channel by the chip code of station 2 and then divides it by the number of stations. 6
7. a. Explain the CSMA/CD mechanism used in standard Ethernet. Draw the flow diagram/algorithm. 3
- b. Why multiple access protocols are needed? Differentiate between CSMA/CD and CSMA/CA. 3
- c. Distinguish between switch and router. Draw a network for IIT, JU that connect our three computer laboratory to Internet. Show the mention network devices on the network. 3
- d. Define logical address and physical address. How can you identify global unique or locally administrated and unicast or multicast from a mac address? 3

$$\begin{cases} 0, & -\pi < x < \pi \\ x, & 0 < x < \pi \end{cases}$$

Institute of Information Technology (IIT)
Jahangirnagar University
2ND part 2ND Semester B.Sc. (Honours) Examination 2017
Course No: IT-2209 Course Title: Computational Mathematics
Full Marks: 60 Time: 3 hours

[N.B.: Answer any FIVE questions. All questions carry equal Marks. The figures in the right margin indicate full marks for the respective questions]

1. (a) Discuss the bisection method to find a real root of the equation $f(x) = 0$ in the interval $[a, b]$. [6]
- (b) Find the root of the equation $x + \ln x - 2 = 0$ using bisection method that lies in $(1, 2)$. [Workout for four decimal places.] [6]

2. (a) Define interpolation and extrapolation. Establish Newton's Forward interpolation formula. [6]
- (b) Table below gives values of square of integers. Using the linear interpolation formula estimate the square root of 3.25. Compare and comment on the results. [6]

x	1	2	3	4	5
x ²	1	4	9	16	25

3. (a) Define divided differences. [6]
Derive Newton's general interpolation formula for $f(x)$ with unequal spaced points.
- (b) Use Newton's general interpolation formula, find an interpolating polynomial from the following table: [6]

x	-1	0	2	5
f(x)	9	5	3	15

Hence find the values of $f(x)$ at $x = 1, 3$ and 4 .

4. (a) Discuss Gauss-Jordan elimination method to solve the following system: [6]
$$a_{k1}x_1 + a_{k2}x_2 + \dots + a_{kn}x_n = b_k, \quad k = 1, 2, \dots, n.$$
- (b) Solve the following system by Gauss-Jordan elimination method: [6]

$$2x_1 + 4x_2 - 6x_3 = -8;$$

$$x_1 + 3x_2 + x_3 = 10;$$

$$2x_1 + 4x_2 - 2x_3 = -12;$$

$$-\pi < x$$

0

- a) i. When does a system said to be strictly diagonally dominant? [5]
 ii. Discuss Gauss-Seidel iteration method to solve a system of simultaneous equations.

- (b) Using Gauss-Seidel iteration method to solve the following system: [7]

$$6x_1 + 15x_2 + 2x_3 = 72$$

$$27x_1 + 6x_2 - x_3 = 85$$

$$x_1 + x_2 + 54x_3 = 110$$

6. (a) Derive the formulae for first and second order derivatives from Newton's backward interpolation formula. [6]

- (b) Determine the values of $f'(2.0)$, $f''(2.0)$, $f'(2.2)$ and $f''(2.2)$ from the following table: [6]

x	:	1.0	1.2	1.4	1.6	1.8	2.0	2.2
$f(x)$:	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

7. (a) Derive Newton's general quadrature formula for numerical integration. [6]
 Hence derive the formula for Simpson's three-eighth rule.

- (b) Calculate the value of $\int_{1.2}^{1.8} \left(x + \frac{1}{x} \right) dx$, taking six sub-intervals, by Simpson's three-eighths rule. [6]
 [Workout for four decimal places.]

Hence find the absolute error.