Institute of Information Technology
Jahangirnagar University

2nd Year 2nd Semester B.Sc. (Hons.) Final Examination, 2018

Subject: **Information System Analysis** Session: 2016-2017

Time: **3** Hours Course Title: **IT-2201** Full Marks: **60**

Answer any **Five (05)** from the following questions. Figures at the right indicate the marks.

1. a. What is called System? Mention the main elements of a system. 3
   b. What are the differences between Physical and Abstract system (using an example)? 3
   c. Short notes on DSS, MIS. 2
   d. Answer the following questions: 4
   I. A small-scale, incomplete, but working sample of a desired system is called _____.
   II. _____ the process, used by systems analyst of identifying or extracting system problems and solution requirements from the user community.
   III. _____use of facilitated workshops to bring together all of the system owners, users, and analysts, and some systems designer and builders to jointly preform systems analysis.
   IV. A technique in which problems are studied to determine their causes and _____

2. a. What are the difficulties to determine the user requirements? 2
   b. For example, there is a Car-trade business XYZ. They have plan to import cars from Japan. Under these circumstances, mention the dimensions of planning for developing their business. 3
   c. What are the categories of information? 2
   d. Draw a DFD for the following case scenario. 5
   Front office of Hotel is responsible for all room reservations, room allocations and final settlement of bills. Any company or person can reserve rooms for their future stay. They have to indicate from what date to what day they need the room. They also have to indicate how many rooms are required. Sometimes the reservations could be canceled or the dates or number of rooms changed. For reservation, cancellation or modification or rooms, customer receives an acknowledgement from the hotel.

3. a. What are the differences between economic feasibility and technical feasibility (using examples)? 3
   b. Scenario 3
   An employee morale problems caused by a new system or lowered company image.
   - Is it tangible cost?
   - Is it intangible cost?
   - Is it tangible benefit?

   Find out the best option.
   c. Scenario 3
   There is a Garment manufacturing industry in Savar. Owner of that factory spends BDT 15 lacs for salary purpose and 7 lacs for factory utilities bill. Hence, you have to identify which one is fixed cost and variable cost?
   d. Write the PIECES problem-solving framework. 3

4. a. What is model driven analysis method? Write the basic difference among the different approaches of model driven methods. 4
   b. Define information system analysis. Write the name of different types of feasibility. 4
   c. Answer the following questions: 4
   I. A feasibility analysis predicts that an admission management system implemented by students of 4th semester of IIT can be sold to Jahangirnagar University administration. What types of feasibility analysis is done here.
   II. If a system has estimated lifetime cost 2 lacs Taka, estimated lifetime benefits 1 core then what would be the lifetime ROI?
   III. After developing and selling a new system, the development team become more experienced, what kind of benefit is it?
   IV. IIT prefers MySQL to implement its student Database. What kind of feasibility analysis is required?

P.T.O

5. a.

Tasks	Effort, no. of days	Duration of tasks	Dependencies
T1	15	10	
T2	8	15	
T3	20	15	T1 (M1)
T4	5	10	
T5	5	10	T2, T4 (M3)
T6	10	5	T1, T2 (M4)
T7	25	20	T1 (M1)
T8	75	25	T4 (M2)
T9	10	15	T3, T6 (M5)
T10	20	15	T7, T8 (M6)
T11	10	10	T9 (M7)
T12	20	10	T10, T11 (M8)

Find out activity bar chart using the column of tasks, duration of tasks and dependencies. 8

b. What are the attributes of good software? 4

6. a. Write the functions of projects management. 3

b. Write the key points of leadership. Write the levels of team maturity. 4

c. A table is given below containing some tasks (T_n), duration of each tasks and dependencies of each task on other tasks and processes (M_n). Draw an activity diagram then find the critical path and finishing date of the project. Consider today's date as the project starting date. 5

Task	Duration	Dependencies
T_1	7	
T_2	9	
T_3	10	$T_1(M_1)$
T_4	15	$T_1(M_1)$
T_5	15	$T_2,T_3(M_2)$
T_6	12	$T_5(M_3)$
T_7	8	
T_8	10	$T_7(M_4)$

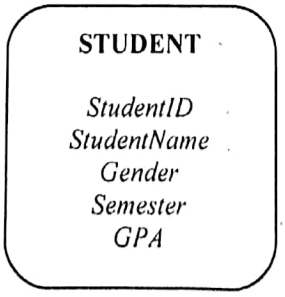
7. a. Define V & V process. 2

b. Given an entity STUDENT in following figure, finds: 3

I. Compound attributes

II. Subsetting criteria

III. Suppose we introduce another entity HALL with attributes *HallName* and *ProvostName*. Can there be a foreign key at STUDENT from HALL?



c. There is a software firm ABC. The CEO of ABC is looking for a tester who will work under the team of Release-Test. A tester came to interview and claimed that he is very good in programming language such as C, C++, JAVA, ... etc. Interestingly, the CEO did not select that guy. Please mention the actual reason to regret that guy. 4

d. Define Stress Testing. Suggest how you might Stress Test the web-server like Torrent or MHC-PMS. 3

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Institute of Information Technology
Jahangirnagar University

2nd Year 2nd Semester B.Sc. (Hons.) Final Examination, 2018

Subject: **Digital Logic Design** Session: 2016-2017

Course Title: **IT-2203**

Time: **3** Hours Full Marks: **60**

Answer any **Five (05)** from the following questions. Figures at the right indicate the marks.

1. a. What is truth table? What are the roles of a truth table in digital logic design? Give a relevant example to your answer. 4
   b. Suppose that you have an unknown two-input gate that might be an OR, AND or NAND gate. What combination of input levels should you apply to the gate's inputs to determine which type of gate it is? 3
   c. How many different sets of input conditions will produce a HIGH output from a five input OR gate and a five-input AND gate? Write the input sequences. 3
   d. Define Boolean constant and variable. 2

2. a. Draw the circuit diagram that implement the following expression: 5
   (i) $x = \overline{A}BC(\overline{A+D})$
   (ii) $y = AC + B\overline{C} + \overline{A}BC$
   (iii) $z = (A+B)(\overline{B}+C)$

   b. Simplify the logic circuit shown in Figure 2 3

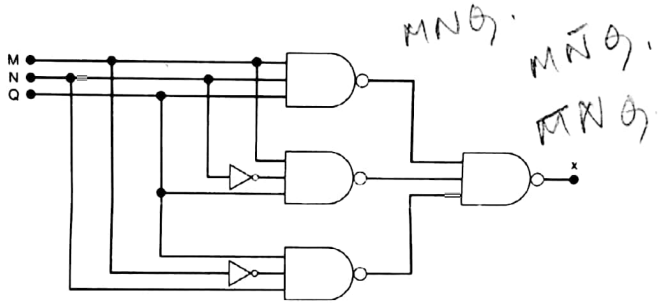

Figure 2: Question # 2 (b)

   c. Simply the expression $z = \overline{\overline{BC}\,\overline{AC}}$ using Demorgan theorems. Also draw the circuit diagram for the simplified expression using universal gate. 4

3. 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 4 3

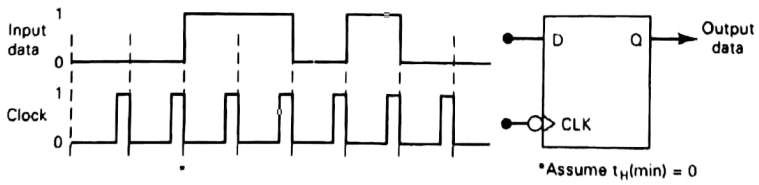

Figure 4: Question # 3 (d)

4. a. Define different types of clock signal with figures. 2
   b. Draw and discuss the operation of a J-K flip-flop. 4
   c. Explain with figure how flip-flops can be used as shift register. 3
   d. Calculate the frequency and the duty cycle of the 555 astable multivibrator output for C=0.001μF, R_A= 2.2 kΩ, and R_B= 100 kΩ. 3

5. a. What is counter? What are the differences between the counter and register? 3
   b. By using J-K flip-flop and any other logic constract a MOD-26 asynchronous counter. 4
   c. Draw the waveforms for all the flip-flops of MOD-26 asynchronous counter with respect to its clock input. 3

d. Assume five-bit binary counter stats in the 00000 state. What will count after 144 input pulses?

6. a. Explain Basic TTL NAND gate 5

b. How many 74ALS00 NAND gate inputs can be driven by a 74ALS00 NAND gate output? 2

Note that, Refer to the 74ALS00 data sheet

LOW state $I_{OL}(\max) \dot{c}\, 8\,mA$ and $I_{IL}(\max) \dot{c}\, 0.1\,mA$

High state $I_{OH}(\max) \dot{c}\, 0.4\,mA$ and $I_{IH}(\max) \dot{c}\, 20\,\mu A$

c. Draw the Logic diagram, truth table and logic symbol for the 74ALS138 5

7. a. Draw and discus the block diagram and flow chart of a successive approximation analog-to- digital converter. Also write the algorithm for this converter. 7

b. Why successive approximation analog-to- digital converter (ADC) is popular over digital ramp ADC? 2

c. Describe the Logic diagram for the 74ALS151 multiplexer; also write the truth table and logic symbol of it. 3

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Institute of Information Technology
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2nd Year 2nd Semester B.Sc. (Hons.) Final Examination, 2018

Subject: **Data Communications** Session: 2016-2017

Time: **3** Hours Course Title: **IT-2205** Full Marks: **60**

Answer any **Five (05)** from the following questions. Figures at the right indicate the marks.

1. a. List the layers of the Internet model. Match the following to one or more layers of the OSI model: 3
   i. Flow control
   ii. Route determination
   iii. Error correction and retransmission
   iv. Reliable process to process message delivery

   b. In figure 1, computer A sends a message to computer D via LAN1, router R1, and LAN2. Show the contents of the packets and frames at the network and data link layer for each hop interface. 4

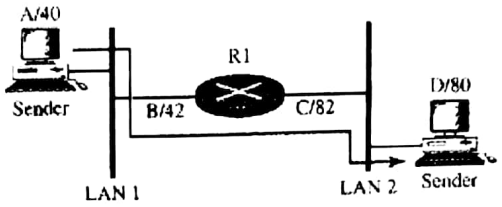


Figure 1: Figure for que 1(b)

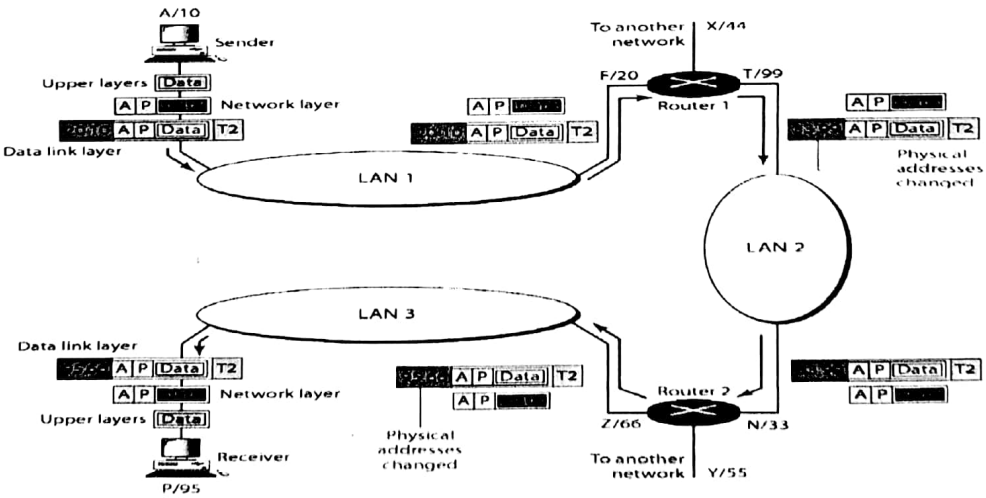
   c. For five devices in a network, What is the number of cable links required for a mesh, ring, bus and star topology? 2

   d. If the data link layer can detect errors between hops, why do you think we need another checking mechanism at the transport layer. 3

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

   c. 6



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. Draw the constellation diagrams for quadrature phase shift keying (QPSK) signals. Explain frequency shift keying (FSK) and discuss how binary FSK could be implemented. 3

b. What is the required bandwidth for the following cases if we need to send 6kbps? d=1.
   i. ASK
   ii. QPSK
   iii. 64-QAM

c. Distinguish between multilevel TDM, multiple slot TDM, and pulse stuffed TDM 3

d. Four 1-kbps connections are multiplexed together. A unit is 1 bit. Find 3
   i. The transmission rate of the link.
   ii. The duration of a time slot
   iii. The duration of a frame

4. a. What is Virtual Circuit Identifier (VCI)? How VCI is updated in the setup phase of virtual circuit switched networks? Explain with proper diagram 5

b. Given the generator polynomial $x^4 + x^2 + x + 1$ and data frame **1010011010**, show the generation of the cyclic redundancy code at the sender site. 4

c. Create W_4 table using W_1 = [-1] and show the four chip sequences. Suppose, four stations share a link during a 1-bit interval. Station 1 and 2 are sending a 1 bit, station 4 is sending a 0 bit and station 3 is silent. Using your generated chip sequences calculate the data that travels through the channel. 3

5. a. What is sliding window? In GO-Back-N ARQ, the size of the send window must be less than 2^m, where, m is the size of sequence number fields in bits. Why? Justify your answer with a flow diagram. 4

b. Using 5-bit sequence number, what is the maximum size of the send and receive windows for each of the following protocols? 3
   i. Stop and Wait ARQ
   ii. Go-Back-N ARQ
   iii. Selective-Repeat ARQ

c. Briefly explain the types of frames used in **HDLC** protocol. 3

d. Define piggybacking and its usefulness. 2

6. a. Explain why Wi-Fi uses Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) rather than CSMA/CD. 3

b. Compare and contrast a random access protocol with a controlled access protocol. 3

c. A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200-kbps bandwidth. Find the throughput if the system produces 500 frames per second. 2

d. Consider figure 2. If N2 transmits to N1, N3 should transmit to N4 simultaneously. But Why RTS/CTS mechanism do not allow this simultaneous transmission? How to solve this problem. Explain with figure. 4

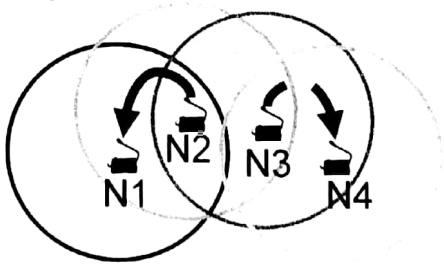
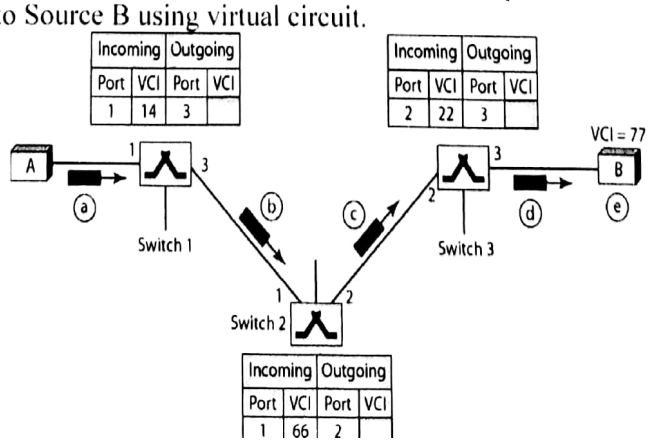


Figure 2: Figure for que. no 6(d)

7. a. Describe different types of propagation mode used in optical fibre 6

b. Consider the following snapshot. Briefly explain each step involved to send a packet from Source A to Source B using virtual circuit. 6



Institute of Information Technology
Jahangirnagar University
2nd Year 2nd Semester B.Sc. (Hons.) Final Examination, 2018
Subject: **Ordinary and Partial Differential Equations** Session: 2016-2017
Course Title: IT-2207

Time: 3 Hours | Full Marks: 60

Answer any **Five (05)** from the following questions. Figures at the right indicate the marks.

1. a. Define order and degree of a equation. Write an ordinary differential equation of order 3 and degree 2. 3

Solve:

$$(e^y + 1)cosxdx + e^y sinxdy = 0$$

b. Solve the ODE $3e^x tanydx + (1 - e^x)sec^2 ydy = 0$ by variable separable. 4

c. Solve: 5

$$\frac{dy}{dx} = \frac{(x + y + 1)}{(x - y + 1)}$$

2. a. Define exact differential equation. Write down the condition exactness of the differential equation. 2

b. Solve the simultaneous differential equations: 6

$$\frac{dx}{dt} + 5x - 2y = e^t$$
$$\frac{dy}{dt} - x + 3y = 2t$$

c. Solve: 4

$$y^2dx + (xy + x^2)dy = 0$$

3. a. Define Partial Differential Equation. 4

Solve:

$$\frac{dx}{xy^3 - 2x^4} = \frac{dy}{2y^4 - x^3y} = \frac{dz}{9z(x^3 - y^3)}$$

b. Form the PDE for the function: 4

$$(x - h)^2 + (y - k)^2 + z^2 = a^2$$

c. Solve: 4

$$x\sqrt{1 + y^2}dx + y\sqrt{1 + x^2}dy = 0$$

4. a. Write down a homogenous linear differential equation and solve the following equation. 6

$$x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 3x$$

b. Solve: 6

$$(D^4 + 2D^3 - 3D^2)y = 3e^{2x} + 4sinx$$

5. a. Expand $f(x) = x^2$ in the interval $-\pi \leq x \leq \pi$ in a Fourier series expansion. Calculate the value of $f(x)$ at $x = 0$. 8

b. Calculate the L.T. of the third derivative of $F(t)$. 4

6. a. Define Laplace transform. Evaluate $L\{e^{-t}cos2t\}$. 3

b. If $L\{F(t)\} = f(s)$, then prove that $L\{F''(t)\} = s^2f(s) - sF(0) - F'(0)$. 3

c. Define inverse Laplace transform. Using Laplace transform, solve the equation 6

$$y'' - 3y' + 2y = 4e^{2t}; y(0) = -3, y'(0) = 5$$

7. a. Find the Fourier series for the function, 6

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

b. Define error function. If $erf\ (x)$ represents the error function then prove that 6

I. $erf(-x) = -erf\ (x)$

II. $erf(\infty) = 1$

END

Institute of Information Technology
Jahangirnagar University
2nd Year 2nd Semester B.Sc. (Hons.) Final Examination, 2018
Subject: **Computational Mathematics** Session: 2016-2017
Course Title: IT-2209 Full Marks: 60
Time: 3 Hours

Answer any **Five (05)** from the following questions. Figures at the right indicate the marks.

1. a. Determine the root of $x^4-8x-10 = 0$ using Bisection method and iterate up to fourth iteration. 3

b. i. State the Newton-Raphson formula. 1

ii. Using Newton-Raphson method find a root of the function $e^{-x}=3x^2$. Take the starting value of x as $x_0 = 1.0$ and refine the value up to third iteration. 3

c. Suppose, you are said to find the root of a function $f(x) = x^2 - 6$ using fixed point iteration method. The function can be manipulated in 3 different ways- 3

i. $x_{i+1} = \frac{6}{x_i}$

ii. $x_{i+1} = x_i^2 + x_i - 6$

iii. $x_{i+1} = \frac{x_i+6}{x_i+1}$

Perform first four iterations using each of the formula(s) (i), (ii) and (iii). Explain which formula will you choose for finding the root of the given function and why? What are the problems with other formula(s)?

d. Differentiate between secant method and false position method. 2

2. a. State some basic rules that are used in the elimination method of solving simultaneous linear equations. 2

b. Use Gaussian elimination to solve the following linear equation. 4

$2a + b + 4c = 12$
$-3b + 8a + 2c = 20$
$4a + 11b - c = 33$

c.

Find the LU decompositions of the coefficient matrices of the following system: 6
$2a + 2b + 2c = 2$
$8a + 6b - 2c = 12$
$6a + 10b + 6c = 8$

3. a. The following table contains the temperature of a particular city on November month. 4

Date (d)	5	8	11	14	17	20
Temperature t(d)	20.5	17.6	16.06	15.75	15.05	14.5

Find the temperature of November 15 using the Lagrange Interpolation Method and second order polynomials.

b. Estimate the temperature of November 18using Newton-Gregory backward difference formula with the help of the table in 3.a 4

4. Evaluate the Newton-Gregory forward difference table for table in 3.a. 2
Explain that, how is Newton's interpolation method better than Lagrange method. 2

4. a. Evaluate the first and second derivative of $\sqrt{x}$ at $x = 15$ from the following data 6

x	15	17	19	21	23
$y = \sqrt{x}$	3.873	4.123	4.354	4.583	4.796

b. Find $\int_4^{5.2} \ln x dx$ by using (i) Trapezoidal rule (ii)Simpson's 1/3 rule (iii) 3/8 rule (iv) Weddle's rule. 6

5. a. Derive the composite trapezoidal rule of computing integrals. 3

b. Use the trapezoidal rule with n=2 and n=4 to estimate the following 4

$$\int_1^2 \frac{dx}{1+2x^2}$$

c. Estimate the following integral by Simpson's 1/3 method using the given n=4

$$\int_0^3 (0.2 + 2.5x - 20.0x^2 + 67.5x^3 - 90.0x^4 + 40.0x^5)dx$$

6. a. Why do we need to use numerical computing techniques to solve differential equations? 1

b. Using Euler's method ~~integrate~~ differentiate the equation 5

$\frac{dy}{dx} = -2x^3 + 8.5x^2 + 2.3x - 9$

from x=1 to x=2.25 with step size 0.25. The initial condition at x=0 is y=1.

c. Use Runge-Kutta Method of Order 4 to solve the following, using a step size of 0.5 for 6

$0 \leq x \leq 1$

$$\frac{dy}{dx} = \frac{5x^2 - y}{e^{x+y}}$$

With y(0)=1

7. a. Write Stirling's formulae for interpolatio. When do you use it? 2

b. Table below gives values of square of intergers. Using the linear interpolation formulae estimate the quare root of 3.25. Compare and cokmment on the results. 5

x	1	2	3	4	5
x^2	1	4	9	16	25

C. Marks obtained by the students in an examination are given bellow: 5

Marks	0-19	20-39	40-59	60-79	80-99
No. Of Students	41	62	65	50	17

Estimate the number of students who obtained less than
(a) 42 Marks
(b) 70 Marks

END