

2nd Year 1st Semester B.Sc. (Hons.) Final Examination, 2019
Institute of Information Technology
Jahangirnagar University

Rimpa

Course Code: IT-2109

Course Title: Statistics and Probability Theory

Full Marks: 60

Time: 3Hr

Answer any five of the following questions.

1. a. Distinguish between _____ [2]
 i) Population and Sample, ii) Discrete and Continuous variable
- b. What are the different level of measurements? Identify the level of measurement for the following statements: [4]
 i) Military rank, ii) Number of email messages, iii) Types of signal, iv) Computer operating system.
- c. An electronic company manufactures power supplies for a personal computer. [6]
 They produce several hundred power supplies each shift and each unit is subjected to a 12-hour burn-in test. The number of units failing during this 12-hour test each shift is shown below (unit-number of failed electric power)
 11, 12, 12, 13, 13, 13, 14, 14, 15, 16, 16, 16, 16, 17, 18, 18, 19, 19, 20, 20.
 Compute the mean, the median and the mode of the data set. Comment on the shape of the distribution.
2. a. What do you mean by measures of dispersion? What are the different measures of dispersion? Among the different measures of dispersion, which one would you prefer and why? [5]
- b. Compute inter-quartile range and standard deviation from the following data: [5]
- | Class Interval | Frequency |
|----------------|-----------|
| 10-15 | 13 |
| 15-20 | 17 |
| 20-25 | 27 |
| 25-30 | 15 |
| 30-35 | 16 |
| 35-40 | 9 |
- c. When coefficient of variation is an important tool? [2]
3. a. Define the following terms: Scatter diagram, Dependent variable. Independent variable, correlation coefficient. [4]
- b. A rocket motor is manufactured by bonding together two types of propellants, an igniter and a sustainer. The shear strength of the body y is thought to be a linear function of the age of the propellant x when the motor is cast. Eight observations are shown in the following table. [8]
- | Age x (weeks) | 15 | 23 | 8 | 17 | 5 | 19 | 24 | 3 |
|--------------------|------|------|------|------|------|------|------|------|
| Strength y (psi) | 2158 | 1678 | 2316 | 2061 | 2207 | 1708 | 1784 | 2575 |
- i) Draw a scatter diagram of the data. Comment on it.
 ii) Calculate correlation coefficient and coefficient of determination. Comment on them.
 iii) Estimate an appropriate regression equation. Comment on the intercept and slope of the equation.
 iv) Estimate the mean shear strength of a motor made from propellant that is 20 weeks old.

4. a. Explain the meaning of the following terms:
 i) Deterministic experiment, ii) probability, iii) Sample Space, iv) Event, v) Mutually exclusive events. [4]
- b. State the additional law and conditional law of probabilities of 2 events. [2]
- c. A computer-consulting firm presently has bids out on two projects. Let $A = \{\text{awarded project } i\}$, for $i = 1, 2$ and suppose that $P(A_1) = 0.41$, $P(A_2) = 0.65$, $P(A_1 \cap A_2) = 0.11$. Determine the following probabilities:
 i) What is the probability that the firm will be awarded at least one project?
 ii) What is the probability that the firm will be awarded exactly one project?
 iii) What is the probability that the firm will be awarded project 1 given that the firm has awarded project no 2? [6]
5. a. What is Binomial distribution? Under what situation a binomial distribution arises? [3]
- b. Give an example of random variable that you think it follows Binomial distribution. State the relationship between mean and variance of Binomial distribution. [4]
- c. When circuit board used in the manufacture of compact disc players are tested, the long run percentage of defective is 5%. Let X = the number of defective boards in a random sample of size $n = 25$, so $X \sim \text{Bin}(25, 0.05)$
 i) Determine $P(X \leq 2)$
 ii) Determine $P(X \geq 5)$
 iii) Determine $P(1 \leq X \leq 4)$
 iv) What is the probability that none of the 25 boards are defective?
 v) Calculate the expected value and standard deviation of X [5]
6. a. Explain the meaning of the following terms:
 Stochastic process, Markov Chain, State and state space [4]
- b. What are the different types of stochastic process? Give a graphical overviews of 2 of them. [4]
- c. Consider the CPU of a computer system modeled as a two-states discrete-parameter Markov chain. The states are indexed by 0 and 1, respectively denote the CPU in user or idle state. We record the states of the CPU at 21 successive time instants and the recorded sequence is:
 1 1 0 0 0 0 1 0 1 0 1 0 1 0 1 0 1 1 1 1
 i) Estimate a transition probability matrix and hence determine the following probabilities
 $P(X_2 = 1 / X_0 = 0)$, and $P(X_3 = 1 / X_1 = 0)$
 ii) Determine the limiting probabilities of user and idle states. Also determine the corresponding mean recurrence time of the user and idle states. [4]
7. a. Define the hypothesis and types of hypotheses. Write down the steps (in flowchart) involved in the hypothesis testing procedure. Define type I and type II errors. [5]
- b. What are the conditions of Binomial distribution? [2]
- c. An insurance broker believes that for a particular contract the probability of making a sale is 0.4. Suppose that the broker has five contracts
 i) Find the probability that she makes at most one sale.
 ii) Find the probability that she makes between two and four sales (inclusive)
 iii). Graph the probability distribution function. [5]



Institute of Information Technology

Jahangirnagar University

2nd Year 1st Semester B.Sc. (Hons.) Final Examination, 2019

Subject: Electronic Device and Circuits

Session: 2017-2018

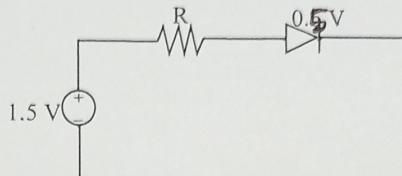
Time: 3 Hours

Course Title: IT-2105

Full Marks: 60

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

- ✓ 1. a) Sketch the symbols for the different types of diodes. Also sketch the characteristics curves for ideal and practical rectifier diode and briefly explain them. 4
b) Classify the solids in terms of band energy with illustration. 4
c) Diode used in the figure has a constant voltages drop at 0.5 V at all currents and a maximum power rating of 100 mW. What should be the value of the resistance R, connected in series for maximum current? 4



- ✓ 2. a) Explain why the conductivity of a semiconductor increases unlikely a metallic conductor with an increase in temperature? 3
b) Explain the process with illustration of changing an intrinsic semiconductor material to an extrinsic semiconductor? 5
c) A block of silicon is doped with donor atom density of $N_D = 3 \times 10^{14}$ atoms/cm³, and with an acceptor atom density $N_A = 0.5 \times 10^{14}$ atoms/cm³. Determine the resultant densities of free electrons and holes. 4

- ✓ 3. a) What is the difference between BJT and FET? 3
b) What is clipper network? Mention the categories of the clipper networks with illustration for square and triangle input signals. 1+5
c) Explain how can diode and transistor be used as switch? 3

- ✓ 4. a) Sketch a correctly biased P-N-P transistor. Also draw a sketch to show the various current components. Write an equation relating I_E , I_B and I_C 3
b) Draw the circuit diagram for common base transistor characteristics using N-P-N transistor? 6
Draw the input and output characteristics curve?
c) Find the relationship between α and β . If the base current in a transistor is 30 μ -A when the emitter current is 2 mA. What are the values of α and β ? 3

5. a) Define the h-parameter. Why h-parameters are important for circuit analysis. 2+2
b) Sketch the h-parameters equivalent for a CE circuit with potential-divider bias. Also find the input impedance, output impedance and voltage gain. 2+6

- ✓ 6. a) Compare the performance of CE, CC, and CB circuits, discuss the typical applications of each type of circuits. 4
b) Discuss the factors involved in the selection of I_C , R_C , and R_E for a single stage common emitter BJT amplifier circuit using voltage- divider bias. Explain the process for determining suitable bias resistors. 5+3

7. a) Sketch a three input summing amplifier and explain its operation. 4
b) Draw the circuit diagram of an instrumentation amplifier. Identify each section of the circuit and find the gain equation. 4
c) A two input summing amplifier is to be designed to produce to 5 V output from two 0.25V inputs. Determine available suitable resistor values for a circuit using a 741 amplifier. 4

Quiz-3

1. What are the key challenges facing software engineering? 5
2. Find out activity bar chart using column of tasks, duration of tasks and dependencies. 5

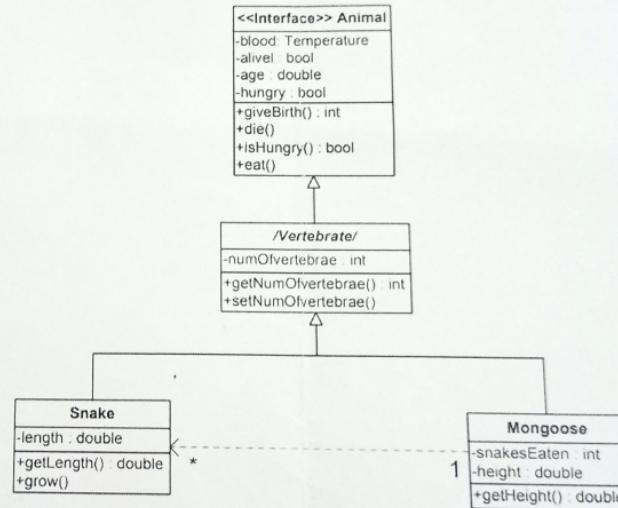
Tasks	Effort, no. of days	Duration of tasks	Dependencies
T1	15	1 Week	
T2	8	1 Week	
T3	20	2 Week	T1
T4	5	2 Week	
T5	5	3 Week	
T6	10	3 Week	T3
T7	25	1 Week	
T8	75	1 Week	
T9	10	2 Week	T5
T10	20	2 Week	
T11	10	3 Week	
T12	20	3 Week	T7

3. What are the attributes of the good software? 5

Handwritten notes:

- 1. Key challenges facing software engineering:
 - 1. Software Engineering is a discipline of engineering.
 - 2. It is a systematic process of developing software.
 - 3. It is a discipline of engineering.
 - 4. It is a discipline of engineering.
 - 5. It is a discipline of engineering.
- 2. Activity Bar Chart (Diagram):
- 3. Attributes of Good Software:
 - 1. Robustness
 - 2. Reliability
 - 3. Maintainability
 - 4. Portability
 - 5. Efficiency

SAD, QUIZ, UML (Bonus 1)



1. What is the relationship between **Vertebrate** and **Animal**? [from the above figure] 2
2. What is the relationship between **Snake** and **Animal**? [from the above figure] 2
3. What is the association type between **Mongoose** and **Snake**? [from the above figure] 2
4. Draw a use case diagram for exams for undergraduate Computer Science courses such as this. Make sure your diagram captures all users and uses of an exam. 4
5. A company consists of Departments. Departments are located in one or more offices. One office acts as a head-quarter. Each department has a manager who is recruited from the set of employees. Please use class diagram model the system for the company. 4



TIME: 3 HOURS

IT 2201: INFORMATION SYSTEM ANALYSIS FULL MARKS: 60

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

1. a. What are the elements of a system? 3
b. Distinguish between the following terms: 6
i. Interaction and interdependence
ii. Physical and abstract systems
iii. Open and closed systems

Discuss the concepts of MIS and DSS. How are they related? How do they differ? 3

2. Suppose you want to build an information system for metro people where they can have information like local transports, utility services like gas, water, electricity etc., medical services, educational and entertainment services. 3

- a. Suggest an appropriate fact finding technique and justify your choice. 6
b. Suggest a design model and briefly describe design process. 6

3. a. What are the differences between managerial and operational MIS planning? 3
b. What categories of information are available for analysis? How would one decide on the category for a given project? 3

4. What basic rules are relevant to construct a DFD? 2
d. Consider for example the discount policy of a Ball-pen manufacturer for its customers. According to the policy the Ball-pen manufacturer give discount to its customers based on the type of customer and size of their order. For the individual, only if the order size is 12 or more, the manufacturer gives a discount of 50% and for less than 12 ball-pen the discount is 30%. Whereas in case of shopkeeper or retailers, the discount policy is different. If the order is less than 12 then there is 15% discount. For 13 to 48 ball-pen order, the discount is 30%, for 49 to 84 ball-pen 40% and for more than 85 ball-pen the discount is 50%. 4

- i. Make a decision tree for the above scenario. 3
ii. Make a decision table for the above scenario. 4

5. Compare two concepts on two (or three) similarities and differences (e.g., class and object, use case diagram and use case description, etc.). Please use tabular format for the above answer. 4

- b. Imagine that you are analyzing requirements for an online forum system. Forums can get very complex, but imagine that we have only two kinds of users that interact with our system with different responsibilities: Regular Users and Administrators. Both can log in to the system, and part of logging in is an internal authentication process. Both can also register with the system, which also uses internal authentication. After logging in, everybody can post new messages to the board, however only Administrators can check statistics and create new threads. Regular users on the other

hand can send private messages to other users, while administrators do not have this ability.

Draw a **Use Case diagram** that contains Actors, Use Cases and their relationship from the scenario described above.

c. Give a **State diagram** that describes the lifetime of a video tape in a video store. You

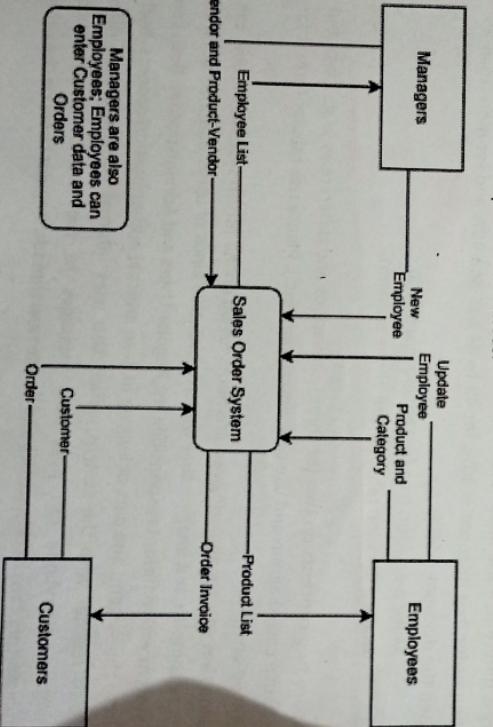
can assume that a video tape is purchased, packaged properly (plastic case with identification information on the outside), put in the video store database, and is then put up for rental. Customers who choose to rent it, check it out and return it in 3 days.

If a customer fails to return it, the store calls him/her the next day. The call is repeated a second time after 2 more days, and if the tape is not returned within 2 more days, the store delegates the matter to a collection agency and removes the video tape from its collection. If the tape is damaged on return, it is removed from the collection database also. Finally, if the tape is missing during the annual store inventory, it is removed from the collection database as well. Make sure to define events, conditions, actions for transitions in your diagram, where appropriate.

5. a. Consider an abstract class Duck, representing all available ducks. Every duck can quack and walk, which are publicly accessible functionalities of every duck. While every duck walks the same way, they quack differently which makes quacking an abstract feature of a duck. Every duck has a weight (float) which determines their ability to float (no pun intended), which ability can be checked by everybody through canFloat method.

The weight of a duck can be set through a method available only for all concrete ducks implementations. A rubber duck, a kind of a duck, has all the features of a duck (yes, it quacks), but when asked to walk – it acts differently, because a rubber duck can't walk, so it overrides a duck walk feature and does nothing. An example of a duck is also a mallard duck that apart of quacking and walking, can also fly.

Draw a **class diagram** depicting classes, with names, attributes and methods along with proper relationship between classes.



Mention the following statements are true or false (including explanation):

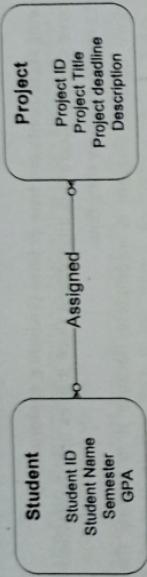
- i. The above context diagram is incomplete since it does not show where the data reside and how they flow.
 - ii. The above context diagram is incomplete because it is missing the cardinalities.
 - iii. The above context diagram is at the right level of detail, such that all the stakeholders can understand it.
 - iv. The managers, employees and customers can also be modelled using other symbols, other than boxes.
- c. Draw a use case diagram for courses. In particular, assume that courses are taught by instructors, while registrars can enroll or remove students from a course. Students take a course, provided they are enrolled in it.
- a. Find out activity bar chart using *column of tasks, duration of tasks and dependencies*.
In addition, mention the required number of weeks to complete the project.

Tasks	Effort, no. of days	Duration of tasks	Dependencies
T1	15	1 Week	
T2	8	1 Week	
T3	20	2 Week	T1
T4	5	2 Week	
T5	5	3 Week	
T6	10	3 Week	T3
T7	25	1 Week	
T8	75	1 Week	
T9	10	2 Week	T5
T10	20	2 Week	
T11	10	3 Week	
T12	20	3 Week	T7

Here one can find certain inspection roles. You have to find out who are the responsible for the following tasks or roles.

- i. The programmer or designer responsible for producing the program or document. Need to fix defects of that program.
- ii. Presents the code or document at an inspection meeting.
- iii. Records the results of the inspection meeting.

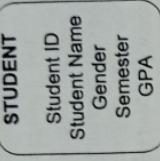
7. a. Given a nonspecific relation in Fig. 1. Resolve it.



b. Given an entity STUDENT in Fig. 2. Find the following terms for it.

- Compound attributes
- Subsetting criteria
- Suppose we introduce another entity HALL with attributes HallName and ProvostName. Can there be a foreign key at STUDENT from HALL?

3



c. Explain which of the following are identifying and nonidentifying relation in Fig. 3.

6

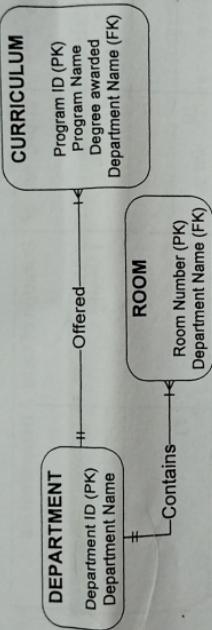


Fig. 2

6

SDA

2nd year 2nd Semester

1. Make a DFD for hotel reservation system. 5
2. What is called SDLC? 5
3. What is the differences between physical and abstract system? 5

Tutorial-1

IIT-2207 Total Marks: 20

Date : 06.11.19 Time : 50minutes

1. a) Define Homogeneous and exact different of equations with example.
- b) Solve : $(x^2 + y^2)dx = (x^2 + xy)dy$.
- c) Solve : $(ax+hy+g)dx+(hx+by+f)dy=0$.
- d) Solve : $(D^4 + D^2 + 1)y = 0$.

**IT2202: ISA Lab
(Class Test 02)**

10. Draw a sequence diagram based on the following story:
- i. Write wrote a story and submit to proof reader.
 - ii. Proof reader correct language errors and submit to editor.
 - iii. Editor suggests some changes in the story.
 - iv. Writer changes and submit again to editor
 - v. Editor submit story to publishers.
 - vi. Publishers published story book and distributed it.
 - vii. Books are available on book store.

2nd Year 1st Semester B.Sc. (Hons.) Final Examination-2019

**Institute of Information Technology
Jahangirnagar University**

Course Code: IT2107

Course Title: Complex Variable & Vector Analysis

Full Marks: 60

Time: 3 Hr

Answer any five of the following questions.

1. a. What do you mean by analyticity of an complex function $f(z)$? State Cauchy Reiman equations. Is the function $f(z) = e^x(\cos y - i\sin y)$ analytic? [6]
- b. Prove that the function $u = 3x^2y + 2x^2 - y^3 - 2y^2$ is harmonic. Find its harmonic conjugate v . [6]
2. a. State Laurent's theorem. Expand $f(z) = \frac{e^{xz}}{(z-1)}$ in a Laurent Series for $z = 1$. Name the singularities and identify the region of convergence of the series. [6]
- b. State argument theorem. Evaluate the integral $\oint_C \frac{f'(z)}{f(z)} dz$ using argument principle [6] where $f(z) = \frac{(z^2+1)^2}{(z+3z+2)^3}$ and C is the circle $|z|=3$.
3. a. Define complex function with an example. Determine the principal value of the argument and graph it if $w = f(z) = -5 + i$. [4]
- b. State Cauchy's integral formula. Evaluate the following: [8]
- $\oint_C \frac{\sin z^2 + \cos z^2}{(z-1)(z-2)} dz$
 - $\oint_C \frac{e^{xz}}{(z+1)^4} dz$
4. a. Discuss the singularities of a complex function. [6]
- b. Mention Residue theorem. Find the residues of $f(z) = \frac{z^2-2z}{(z+1)^2(z+4)}$ at all its poles in the finite plane. [6]
5. a. Evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos\theta} d\theta$ by using the method of contour integration. [6]
- b. Expand $f(z) = \ln(1+z)$ in a Taylor series about $z = 0$. Determine the region of convergence of the series. [6]
6. a. Differentiate between scalar and vector. Show that $\underline{A} = \frac{2i-2j+k}{3}, \underline{B} = \frac{i+2j+2k}{3}$ and $\underline{C} = \frac{2i+j-2k}{3}$ are mutually orthogonal unit vectors. [4]

- b. Find the acute angle(s) which the line joining the points $(1, -3, 2)$ and $(3, -5, 1)$ makes with the coordinate axes. [4]
- c. Two sides of a triangle are formed by the vectors [4]

$$\underline{A} = 3\underline{i} + 6\underline{j} - 2\underline{k} \text{ and}$$

$\underline{B} = 4\underline{i} - \underline{j} + 3\underline{k}$. Determine the obtuse angle(s) of the triangle (if any).

7. a. Calculate the projection of the vector $4\hat{i} - 3\hat{j} + \hat{k}$ on the line passing through the points $(2, 3, -1)$ and $(-2, -4, 3)$. [4]
- b. If $\underline{A} = 2\underline{i} + \underline{j} - 3\underline{k}$ and $\underline{B} = \underline{i} - 2\underline{j} + \underline{k}$, discover a vector of magnitude 5 perpendicular to both \underline{A} and \underline{B} . [4]
- c. Prove that $\underline{A} \times (\underline{B} \times \underline{C}) = \underline{B}(\underline{A} \cdot \underline{C}) - \underline{C}(\underline{A} \cdot \underline{B})$. [4]

Q1. Define the following:

Dependent variable, independent variable, correlation coefficient and coefficient of determination.

Q2. The owner of Maumee Motors wants to study the relationship between the age of car and its selling price. Listed below is a random sample of 12 used cars sold at Maumee motors during the last year.

- a. If we want to estimate selling price based on the age of the car, which variable is the dependent variable and which is the independent variable?
 - b. Draw a scatter diagram.
 - c. Determine the coefficient of correlation.
 - d. Determine the coefficient of determination.
 - e. Interpret these statistical
- . c. Determine the regression equation. b. Estimate the selling price of a 10-year old car. Interpret the regression equation.

Car	1	2	3	4	5	6	7	8	9	10	11	12
Age (yrs) X	9	7	11	12	8	7	8	11	10	12	6	6
Selling price (\$000) Y	8.1	6	3.6	4	5	10	7.6	8	8	6	8.6	8

- Q1. a) Define Critical value and Type I error. 1
b) State the different steps of a statistical hypothesis 1
c) A manufacturer of detergent claims that the contents of boxes sold weigh on average at least 16 ounces. The distribution of weight is known to be normal. A random sample of 16 boxes yielded a sample mean weight of 15.84 ounces and sample standard deviation is 0.4 ounce. Test at the 5% significance level the null hypothesis that the population mean weight is at least 16 ounces. 3
- Q2 a) What is a binomial distribution? State the relationship between mean and variance of a binomial distribution. 2
b) A company receives 60% of its orders over the Internet. Within a collection of 18 independently placed orders, what is the probability that: 3
(i) between eight and ten of the orders are received over the Internet?
(ii) no more than one of the orders are received over the internet?
Determine the mean and variance of the number of orders.

Institute of Information Technology (IIT), Jahangirnagar University
Tutorial # 02, Course: IT 2107 (Complex Variable and Vector Algebra)
Full Marks: 25, Time Allowed: 30 Minutes

1. Define complex function with an example. Determine the principal value of the argument and graph it if $w = f(z) = -5 + i$. [7]
2. What do you mean by analyticity of a complex function $f(z)$? State Cauchy-Riemann equations. Is the function $f(z) = e^x(\cos y - i\sin y)$ analytic? [9]
3. Determine a so that the function $u = e^{\pi x} \cos av$ is harmonic. [9]

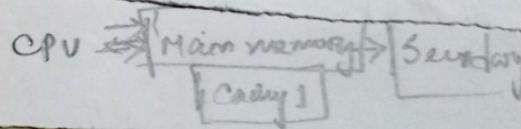
Quiz-2

1. Mention the MIPS Fields. 5
2. Find out the op-code for:
 - add \$t0, \$s1, \$s2 5
 - lw \$t0, 1200(\$t1) 5

Q-3

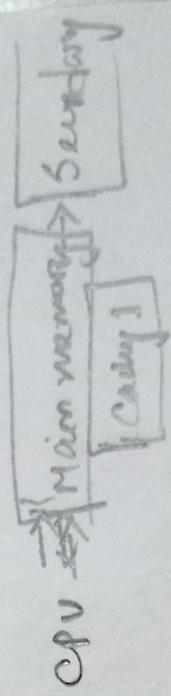
1. Design complete memory addressing for 8 RAM through 74LS138 decoder, where each RAM size is 4K and starting address of memory design is 0000H.

4. Design a 3-level based memory system in computer.



Q-3 (any two, 2+2=10/)

1. Design a complete FULL Adder using VHDL description.
2. Derive an equation $t_A = t_{A1} + (1 - H)t_B$ for two level memories, where t_{A1} and t_{A2} are access time of M1 and M2, t_A is the average time, and H is the hit ratio.
3. Mention the basic difference of bus arbitration using daisy chaining and bus arbitration using polling.
4. Design a 3-level based memory system in computer.



Institute of Information Technology
Jahangirnagar University, Savar, Dhaka
2nd Year 1st Semester B.Sc. (Hons.) Examination 2019 (Tutorial 2)

Course Code: IT-2105
Total Marks: 15

Course Title: Electronic Devices and Circuits
Times: 30 Min.

Answer ALL questions:

1. What is a transistor? How does it differ from a PN-junction diode? Draw the circuit symbols for NPN and PNP transistor and mention the difference with reasons. 5
2. What is stability factor? Does the smaller value of stability factor mean a more stable circuit? Give reasons in favor of your answer. 5
3. Define leakage current and drive an equation relating I_C , I_B , and I_{CBO} . 5

Institute of Information Technology

- Class Test: 3 Course Algorithm Analysis (IT-2101) Total Marks: 10
- (1) What is meant by back tracking method? Draw a possible solution space for a 4-queen problem. 4
- (2) What is an optimal greedy choice for activity selection? 2
- (3) What are the main steps of a greedy algorithm? 4



1. Define complex fu
2. What do you m
3. Determine a s
Riemann equat



Institute of Information Technology

Jahangirnagar University

2nd Year 1st Semester B.Sc. (Hons.) Final Examination, 2019

Subject: Computer Architecture

Session: 2017-2018

Time: 3 Hours

Course Title: IT-2103

Full Marks: 60

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

1. a) What do you understand by embedded systems? How do they differ from conventional computing? 4

- b) What are the most common physical memories used today? Briefly describe them. 5

- c) List some key characteristics of memory systems and briefly describe any two of them. 3

2. a) Write short notes on CPI, MIPS, Program Execution time (T), and Frequency. 4

- b) 4

Processor	CPI	Clock rate
P1	1.5	3 Mhz
P2	1	2.5 Mhz
P3	2.2	4 Mhz

- i. P1, P2, P3 executes a program in 100 seconds then find out the number of cycles and the number of instructions (Use the data of above given table). 4

- ii. If Hardware designer wants to reduce executing time by 30% but it leads to an increase of 20% in the CPI. Under these circumstances, find the new clock rate of P1, P2, P3 (Use the data of above given table).

- c) What are three factors determine a computer's performance and how? 4

3. a) A floating point number is M, E (M. Mantissa, E. Exponent). Assume M and E are both 4-bit and sign magnitude integers. In addition, base B=2. Under these circumstances, 4

- i. Find out the smallest non-zero positive and negative number.

- ii. Find out the biggest non-zero positive and negative number.

- b) Perform signed fraction number multiplication: where multiplier= 10110011 and 6 multiplicand= 11010101 using Robertson multiplication algorithm.

- c) For division perform, write Booth algorithm. 2

4. a) What is cache memory? What is its significance in a computer system? 3

- b) Differentiate between the structures of cache memory and main memory by illustration. 3

- c) Draw a flowchart that illustrates the read operation of cache memory. 3

- d) List some design parameters of cache memory. State about **write through** and **write back** policies. 3

5. a) Design a 3-level based memory system in computer. 2

- b) Given five memory partitions of 100Kb, 500Kb, 200Kb, 300Kb, 600Kb (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 212 Kb, 417 Kb, 112 Kb, and 426 Kb (in order)? Which algorithm makes the most efficient use of memory? 5

- c) Consider a paging system in which M₁ has a capacity of three pages. The execution of a program Q queries reference to five distinct pages P_i where i=1, 2, 3, 4, 5, and i is the page address. The page stream formed by executing Q is 5

2 3 2 1 5 2 4 5 3 2 5 2

Under these circumstances, using FIFO, LRU, and OPT find out the page hit ratio.

Please Turn Over

6. a) Design a complete FULL Adder using VHDL description. 7
b) There is an instruction. SUB \$t0, \$s1, \$s2 3
For the above instruction, the decimal value of the first source operand is 17 and second operand is 18. In addition, the decimal value of destination operand is 8. Therefore, find out the MIPS binary-coding for the above instruction.
- c) Mention the major computer design level. 2
7. a) Derive an equation $t_A = t_{A1} + (1 - H)t_B$ for two level memories, where t_{A1} and t_{A2} are access time of M1 and M2, t_A is the average time, and H is the hit ratio. 4
b) What are the differences between RISC and CISC processor? 3
c) Short note on SCSI. 2
- d) Mention the basic difference of bus arbitration using daisy chaining and bus arbitration using polling. 3



INSTITUTE OF INFORMATION TECHNOLOGY

Jahangirnagar University

2nd Year 1st Semester B.Sc. (Hons.) Final Examination, 2018

Subject: Electronic Devices and Circuits

Session: 2016-2017

Time: 3 Hours

Course Title: IT-2105

Full Marks: 60

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

1. (a) The hybrid parameters for a transistor used in CE configuration are $h_{ie} = 1000 \Omega$; $h_{fe} = 150$; $h_{re} = 1.2 \times 10^{-4} \Omega$; $h_{oe} = 25 \times 10^{-6} \Omega$. The transistor has a load resistance of 10 KΩ in the collector and is supplied from a signal source of resistance 5 KΩ. Compute the value of input impedance, output impedance, current gain and voltage gain. 6
- (b) Give a detailed description of construction and operation of JFET. 3.5
- (c) Compare JFET and MOSFET. (any five) 2.5
2. (a) Discuss the construction and operation of a zener diode. Draw the I-V curve of the zener diode. Mention some applications of it. 3
- (b) Explain the difference between clipping and clamping circuits. 2
- (c) Draw the functional block representation of an ac-to-dc converter. 3
- (d) Draw the output waveform for the diode circuits given in figure 2 4

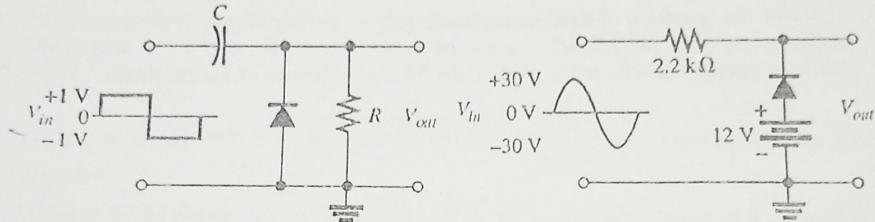
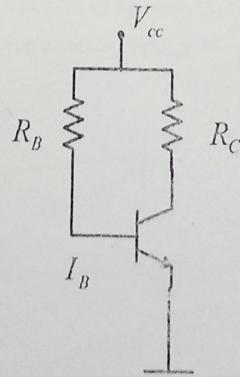


Figure 2: Question 2(d)

3. (a) Sketch a correctly biased P-N-P transistor. Also draw a sketch to show the various current components. Write an equation relating I_E , I_B and I_C 3
- (b) Draw the circuit diagram for common-base transistor characteristics using N-P-N transistor? 6
- (c) Draw the input and output characteristic curve?
- (d) Find the relationship between α and β . If the base current in a transistor is $30 \mu A$ when the emitter current is 2 mA. What are the values of α and β ? 3
4. (a) Explain the operation of the voltage divider bias circuit. Show all the voltages polarities and current direction. 6
- (b) Design a base bias circuit, as shown in Figure 3, to have $V_{CE} = 5$ volt and $I_C = 5$ mA. The supply voltage is 15 V and $h_{fe} = 100$. Also find the stability factor S. 4



5. (a) What are the advantages of FET over BJT? Explain the operation of n-channel JFET. 4
 (b) Sketch the h -parameter equivalent circuit for a transistor connected in CE configuration. 5
 (c) Identify each component of the circuit and discuss its origin. 5
 0. Plot the I_D vs V_{DS} characteristics for a JFET from the given data table obtained with $V_{GS} = 0$. Determine I_{DSS} vs V_P from the characteristic curve. 3
- | V_{DS} (V) | 0 | 1 | 2 | 2.5 | 3 | 3.5 | 3.75 | 4 | 6 | 9 |
|--------------|---|---|---|-----|-----|-----|------|---|---|---|
| I_D (mA) | 0 | 3 | 6 | 7 | 7.5 | 7.8 | 8 | 8 | 8 | 8 |
- Use graph paper to plot the I_D vs V_{DS} characteristics curve.
6. (a) Sketch a three input summing amplifier and explain its operation. 4
 (b) Draw the circuit diagram of an inverting and non-inverting amplifier. Find the gain equation. 4
 (c) Design and explain the operation of an Integrator. 4
7. (a) Describe the operation of a phototransistor. 4
 (b) Differentiate SCR and TRIAC. 4
 (c) With the energy band diagram, explain the VI characteristics of Tunnel diode. 4

END



Institute of Information Technology

Jahangirnagar University

2nd Year 1st Semester B.Sc. (Hons.) Final Examination, 2018

Subject: Complex Variable and Vector Analysis

Session: 2016-2017

Time: 3 Hours

Course Title: IT-2107

Full Marks: 60

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

1.

- (a) Define unit vector with an example. Obtain the unit vector that has the same direction as $\vec{v} = 2\hat{i} + 2\hat{j} - \hat{k}$. [5]
(b) Give the definition of the dot product. Find the direction cosines of the vector $\vec{v} = 2\hat{i} - 4\hat{j} + 4\hat{k}$, and approximate the direction angles to the nearest degree. [7]

2.

- (a) A force of $\vec{F} = 3\hat{i} - \hat{j} + 2\hat{k}$ is applied to a point that moves on a line from $P(-1,1,2)$ to $Q(3,0,-2)$. If distance is measured in feet, how much work is done? [4]
(b) If u and v are vectors in 3-space, then show that $\vec{v} \cdot (\vec{u} \times \vec{v}) = 0$. [4]
(c) Find the area of the triangle that is determined by the points $P(2,2,0)$, $Q(-1,0,2)$ and $R(0,4,3)$. [4]

3.

- (a) Illustrate analytic function. State Cauchy-Riemann equations. [4]
(b) Prove that $u = e^{-x}(x \sin y - y \cos y)$ is harmonic. Find v such that $f(z) = u + iv$ is analytic. [8]

4.

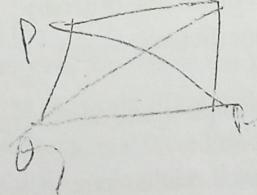
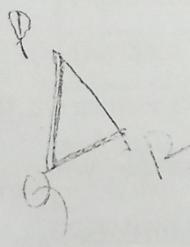
- (a) Locate and name all the singularities of $f(z) = \frac{z^8+z^4+2}{(z-1)^2(3z+2)^2}$. Determine where $f(z)$ is analytic. [5]
(b) Mention Cauchy's theorem. Evaluate $\oint_C \frac{dz}{z-a}$, where C is any simple closed curve and $z = a$ is (i) outside C , (ii) inside C . [7]

5.

- (a) Describe Cauchy's integral formula. Define meromorphic function with an example. [4]
(b) Evaluate the following integrals [8]
- (i) $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$
(ii) $\oint_C \frac{e^{2z}}{(z+1)^4} dz$,
where C is the circle $|z| = 3$.

6.

- (a) What is residue of a complex function? Find the residues of $f(z) = \frac{z^2-2z}{(z+1)^2(z^2+4)}$ at all its poles in the finite plane. [6]
(b) Evaluate $\int_0^\infty \frac{dx}{x^6+1}$. [6]
- (a) State and prove Taylor's series theorem of an analytic function $f(z)$. [7]
(b) Expand $f(z) = \sin z$ in a Taylor's series about $z = \frac{\pi}{4}$. Also determine the region of convergence of this series. [5]



Institute of Information Technology

Jahangirnagar University

B.Sc(Honors) 2nd Year 1st Semester Final Examination 2018

Course: IT 2109(Statistics and Probability Theory)

Full Marks: 60

Time: 3 hours

[Answer any **FIVE** of the following questions. Each set of questions carry equal marks]

- 1.(a) What do you mean by statistics? Write down the important applications of statistics in information technology. Define data with example. 4
 (b) Define variable with example. Briefly explain the qualitative and quantitative variable. 4
 (c) What is frequency distribution? Why do you use such distribution? Why graphical presentation is so important? 4

2. (a) What is dispersion? What are the measures of dispersion? 4
 (b) Write down the merits and demerits of mean deviation and standard deviation. 4
 (c) A frequency distribution of weights (in kg) of 45 students are given below:

Income in Taka	45-50	50-55	55-60	60-65	65-70	70-75	75-80
Frequency	5	6	6	8	10	6	4

Compute the mean deviation and coefficient of variation. 4

3. (a) What is coefficient of variation (CV)? Why coefficient of variation is so important? 4
 (b) Establish the relation between μ 's and ν 's. 4
 (c) Compute the kurtosis (based upon the fourth moment about the mean) of the following frequency distribution. 4

Weight of student	0-99	100-199	200-299	300-399	400-499	500-599	600-699
Number of families	50	70	203	406	403	42	5

4. (a) Write down the uses of correlation coefficient. 3
 (b) The following table shows the data of the heights of father and his son : 9

Height of father(cm) (x)	165	166	167	168	167	169	170	172
Height of son(cm) (y)	167	168	165	172	168	172	169	171

- i. Fit the regression equation of the line of y on x.
 ii. Fit the regression equation of the line of x on y.
 iii. Calculate the correlation coefficient.

5. (a) Define the terms experiment, sample space and event with example. Write down the properties of the probability. 4
 (b) Two thousand randomly selected adults were asked if they think they are

persons included in the survey and whether they are financially better off, the same as, or worse off than their parents.

8

	Less than high school(X)	High school(Y)	More than high school(Z)
Better off(A)	140	450	420
Same as (B)	60	250	110
Worse off(C)	200	300	70

If one adult is selected at random from these 2000 adults, find the probability that this adult is

- P(Financially better off given less than high school)
- P(High school given financially worse off)
- P(better off and high school)
- P(more than high school and worse off)

6. (a) Write down the conditions of a binomial experiment. 2

(b) According to a National Public Radio poll, 46% of American school principals believe that students pay little attention to science education provided in schools. Suppose that this result is true for the current population of American school principals. 10

- Let x be a binomial random variable denoting the number of American school principals in a random sample of 7 who do not believe that students pay little attention to science education taught in schools. Write the probability distribution of x and draw a graph of the probability distribution. Determine the mean and standard deviation of x .
- Find the probability that in a random sample of 7 American school principals, at most 4 believe that students pay little attention to science education taught in schools.

7. (a) Define hypothesis. What is null and alternative hypothesis? Define level of significance. 4

(b) What is power of the test and p-value? Define confidence interval with example. 3

(c) Suppose the manager of a textile industry suspects that the mean time lost due to the sickness of the night shift workers exceeds the mean time for the day shift workers. To check it, the manager randomly selected 12 workers in each shift category and record the number of days lost due to sickness within the past year.

Night Shift	12	10	20	15	18	9	12	10	21	25	13
Day Shift	8	10	15	9	12	16	15	20	5	18	12

If the number of days per year lost due to the sickness for the night shift and day shift workers are normally distributed with mean μ_1 and μ_2 and variance σ_1^2 and σ_2^2 respectively, test the significance of the difference of population means if the population variances are not equal. The table value



Institute of Information Technology

Jahangirnagar University

2nd Year 1st Semester B.Sc. (Hons.) Final Examination, 2017

Course Code: IF-2105
Time: 3 Hours

Title: Electronic Devices & Circuits
Full Marks: 60

Answer any **Five (05)** from the following questions

All parts of a particular question must be answered consecutively

1. a) Explain the phenomenon of hole current in terms of energy band.

b) Draw the circuit diagram of a full wave rectifier using centre tapped transformer and explain the operation.

c) In the full wave bridge type circuit shown in Fig. 1, the diodes are assumed to be ideal.

Find:

(i) d.c. output voltage (ii) peak inverse voltage (iii) output frequency.

Assume primary to secondary turns to be 4.

4

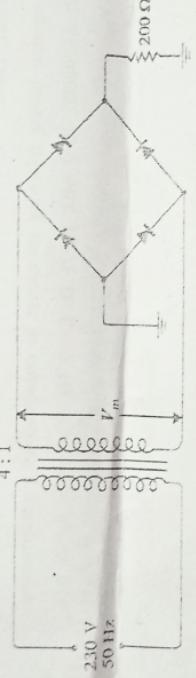


Fig.1: Full wave bridge type circuit

2. a) Derive the relation between α and β .

b) Explain the output characteristics of a transistor in common emitter configuration.

c) Find the α rating of the transistor shown in Fig. 2. Hence determine the value of I_C using both α and β rating of the transistor.

3

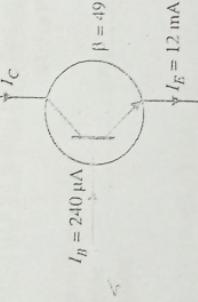


Fig.2: Common emitter transistor circuit

3
4. a) What is meant by multistage transistor amplifier? Draw its block diagram.

3
b) Define Hybrid Parameter. How can you determine hybrid parameter for a linear circuit?

5
c) A certain amplifier has voltage gain of 15 db. If the input signal voltage is 0.8V, what is the output voltage?

4. a) What is a transistor? what is BJT? Why BJT is a bipolar device? Explain how a BJT can be used as an amplifier. 5

b) Prove the following relation for CE transistor configuration 4

$$I_{CEO} = \beta I_B + (1 + \beta) I_{BO}$$

c) A transistor has $I_{CBO} = 50 \mu\text{A}$ and $\alpha = 0.99$. If $I_B = 50 \mu\text{A}$, determine 5

- i. β , I_{CEO} and

- ii. I_C , neglecting leakage current.

5. a) What is meant by operational amplifier? Why it is so called? 3

b) Derive the gain equation of an inverting amplifier in terms of voltage attenuation and gain of the feedback circuit. 3

c) The IC 741 op-amp having following parameters is connected as a non-inverting amplifier with $A=200000$, $R_i=2 \text{ M}\Omega$, $R_o=75 \Omega$, $f_o=5 \text{ Hz}$, $R_1=1 \text{ K}\Omega$, $R_F=10 \text{ K}\Omega$, $V_{CC}=+15 \text{ V}$, $-V_{EE}=-15 \text{ V}$ and output voltage swing $\pm 14 \text{ V}$. Compute the values of A_F , R_{in} , R_{out} , f_T and $V_{o\text{off}}$. 5

6. a) Explain why open loop op-amp is unsuitable for linear applications. 3

b) Derive the ideal voltage gain equation for a non-inverting feedback amplifier. 3

c) A differential amplifier has an output of 1V with a differential input of 10 mV and an output of 5 mV with a common-mode input of 10 mV. Find the CMRR in dB. 5

7. a) What is meant by negative feedback? Write down some advantages of it. 3

b) Explain the circuit operation of the Tuned collector oscillator with circuit diagram. 3

c) Determine the maximum and minimum peak-point voltage for a UJT with $V_{BB}=25 \text{ V}$. 5

Given that UJT has a range of $\eta = 0.74$ to 0.86. 4

<.....END.....



Institute of Information Technology (IIT)

Jahangirnagar University, Savar Dhaka

2nd Year 1st Semester B.Sc. (Hons) Final Examination-2017

Course Code: IT-2107

Time: 3 Hours

Course Title: Complex Variable and Vector Algebra

Full Marks: 60

Answer any **FIVE** of the following questions

- (a) Define scalar and vector products of two vectors. Give the geometrical interpretation of vector product of two vectors. 5
- (b) Show that $(\underline{a} \times \underline{b})^2 = \underline{a}^2 \underline{b}^2 - (\underline{a} \cdot \underline{b})^2$. Given that $x\underline{a} = \underline{b}$, find x. 2
- (c) If $\underline{a} = 3\hat{i} - \hat{j} - 2\hat{k}$ and $\underline{b} = \hat{i} + 3\hat{j} + \hat{k}$, find 5

(a) $\underline{a} \times \underline{b}$,
(b) $\left[\underline{a} + \underline{b} \right] \times \left[\underline{a} - \underline{b} \right]$.

- (a) If \underline{a} is any vector, prove that 4
1. $\underline{a} = (\underline{a} \cdot \hat{i})\hat{i} + (\underline{a} \cdot \hat{j})\hat{j} + (\underline{a} \cdot \hat{k})\hat{k}$
 2. $2\underline{a}^2 = \left| \underline{a} \times \hat{i} \right|^2 + \left| \underline{a} \times \hat{j} \right|^2 + \left| \underline{a} \times \hat{k} \right|^2$
- (b) If $\underline{a} + \underline{b} + \underline{c} = 0$, show that $\underline{a} \wedge \underline{b} = \underline{b} \wedge \underline{c} = \underline{c} \wedge \underline{a}$. Also interpret the results geometrically. 5
- (c) If $|a + b| = |a - b|$, then show that \underline{a} and \underline{b} are perpendicular. 3

- 4(a). Illustrate the followings with example:
 a) Complex variable
 b) Complex Function
 c) Singularity
- (b) Express e^{-x^2} in the form $f(z) = u(x, y) + iv(x, y)$. 2
- (c) Express $\frac{\sec^2 \theta - \tan^2 \theta + i \sin \theta}{\sec^2 \phi - \tan^2 \phi + i \cos \phi + i \sin \phi}$ in the form $A + iB$. Also find its modulus. 4

(d) Obtain 'c' poles of

$$f(z) = \frac{z + 7i}{(z^2 - 2iz - 1)^2 (z^2 + 1)^3 (z - 3i)}$$

3

- ✓ 5(a). When a function is said to be analytic in a region R ? 2
 ✓ 5(b). If $f(z) = u + iv$ is an analytic function, show that, in polar form, the Cauchy-Riemann equations are $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}$ and $\frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}$. 5
 (c). Prove that the function $u = 3x^2y + 2x^2 - y^3 - 2y^2$ is harmonic. Find its harmonic conjugate v and express $u + iv$ as an analytic function of z . 5
- ✓ 6(a). State Laurent's theorem. Expand $f(z) = \frac{1}{z(z-2)}$ in a Laurent series for the region 7
 (i) $0 < |z| < 2$: (ii) $|z| > 2$.
 (b). State Taylor's theorem. Expand $\log\left(\frac{1+z}{1-z}\right)$ in a Taylor series about $z = 0$. 5
 ✓ 7(a). Evaluate the following by using the method of contour integration: 12
 ✗ i) $\int_0^{2\pi} \frac{d\theta}{5+4\cos\theta}$
 ii) $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+4)(x^2+9)} dx$



Institute of Information Technology (IIT)

Jahangirnagar University, Savar Dhaka

2nd Year 1st Semester B.Sc. (Hons) Final Examination-2017

Course Code: IT-2109

Course Title: Statistics and Probability Theory

Time: 3 hours

Full Marks: 60

Answer any FIVE Questions

- a) Briefly explain different types of data collection method. 4
- b) What are the different types of measures of location? 4
- c) Write the three different situations where geometric mean, harmonic mean and arithmetic mean is appropriate? 4
- a) Write two differences between Bar chart and Histogram. 2
- b) What do you mean by quartile and percentile? Assume that an examination was conducted on 80 students and their scores obtained in a course IT-2109 on 60. The Average is 48.5 with standard deviation 25.8, 3rd quartile is 53.2 and 25th percentile is 30.7, median is 45.2 and mode is 40.5. Explain the above results. 6
- c) Define the term standard deviation. Why do most researchers use standard deviation to measure dispersion of data? 4
- a) What are the conditions of Binomial distribution? 4
- b) Write the function of this distribution. When a binomial distribution tends to a Poisson distribution? 4
- c) Vehicles pass through a junction on a busy road at an average rate of 300 per hour.
a. Find the probability that none passes in a given minute.
b. What is the expected number passing in two minutes?
c. Find the probability that this expected number actually pass through in a given two-minute period. 4
- a) In what situations distribution of random variables follow Poisson distribution or exponential distribution? 4
- b) Why exponential distribution is called a memoryless distribution? 4
- c) The number of calls coming per minute into a hotels reservation center is Poisson random variable with mean.
i. Find the probability that no calls come in a given 1 minute period.
ii. Assume that the number of calls arriving in two different minutes is independent. Find the probability that at least two calls will arrive in a given two minute period. 4

QUESTION PAPER

6. a) Define hypothesis and types of hypotheses. Write down the steps (in flowchart) involved in the hypothesis testing procedure. Define type I and type II errors. 5
b) When coefficient of variation is an important tool? 2
c) An insurance broker believes that for a particular contract the probability of making a sale is 0.4. Suppose that the broker has five contracts.
(i) Find the probability that she makes at most one sale.
(ii) Find the probability that she makes between two and four sales (inclusive).
Graph the probability distribution function.

7. a) Define stochastic process, birth-death process and markov chain with suitable example. 4
b) What do you mean by M/M/1, M/M/C and G/M/1? 3
c) Compute inter-quartile range and standard deviation from the following data. 5
- | Class interval | Frequency |
|----------------|-----------|
| 10-15 | 13 |
| 15-20 | 17 |
| 20-25 | 27 |
| 25-30 | 15 |
| 30-35 | 16 |
| 35-40 | 9 |

- a) What are the difference between regression and correlation? 2
b) Explain the situation when a correlation ($r=0$, $r=1$, and $r>1$) 4
c) A company wants to know how job performance relates to IQ. Data are given in the following table: 6

Serial #	Performance	IQ
1	60	31
2	61	36
3	62	38
4	63	40
5	65	41

Estimate the degree of association between job performance and IQ. Is this association significant? 4
Estimate a regression equation of Performance on IQ and comment on the results. 6