Subject: English (B.Sc)　　　　BA/ B.Sc Part-1　　　　Time: 03Hrs.
Paper: Compulsory　　　　　　Annual 2019　　　　　Max. Marks:50

Note: Attempt all questions.

Section A

Q.1.　Read the following passage and answer the question:

Many artists late in the last century were in search of a means to express their individuality. Modern dance was one of the ways some of these people sought to free their creative spirit. At the beginning there was no exacting technique, no foundation from which to build. In later years trial, error, and genius founded the techniques and the principles of the movement. Eventually, innovators even drew from what they considered the dread ballet, but first they had to discard all that was academic so that the new could be discovered. The beginnings of modern dance were happening before Isadora Duncan, but she was the first person to bring the new dance to general audiences and see it accepted and acclaimed. Her search for a natural movement form sent her to nature. She believed movement should be as natural as the swaying of the trees and the rolling waves of the sea, and should be in harmony with the movements of the Earth. Her great contributions are in three areas.

First, she began the expansion of the kinds of movements that could be used in dance. Before Duncan danced, ballet was the only type of dance performed in concert. In the ballet the feet and legs were emphasized, with virtuosity shown by complicated, codified positions and movements. Duncan performed dance by using all her body in the freest possible way. Her dance stemmed from her soul and spirit. She was one of the pioneers who broke tradition so others might be able to develop the art.

Her second contribution lies in dance costume. She discarded corset, ballet shoes and stiff costumes. These were replaced with flowing Grecian tunics, bare feet, and unbound hair. She believed in the natural body being allowed to move freely, and her dress displayed this ideal.

Her third contribution was in the use of music. In her performances she used the symphonies of great masters, including Beethoven and Wagner, which was not the usual custom. She was as exciting and eccentric in her personal life as in her dance.

Questions:

　　1. Which of the following would be the best title for the passage?　　　　　　　　(2)
　　　　(A) The Evolution of Dance in the Twentieth Century　　(B) Artists of the Last Century
　　　　(C) Natural Movement in Dance　　　　　　　　　　　(D) A Pioneer in Modern Dance
　　2. According to the passage, what did nature represent to Isadora Duncan?　　　　(2)
　　　　(A) Something to conquer　　　　　　　　　　　　　(B) A model for movement
　　　　(C) A place to find peace　　　　　　　　　　　　　(D) A symbol of disorder
　　3. Which of the following is NOT mentioned in the passage as an area of dance that Isadora Duncan worked to change?　　　　　　　　　　　　　　　　　　　　　　　　(2)
　　　　(A) The music　　　(B) The stage sets　　　(C) Costumes　　　(D) Movements
　　4. Write precise of the above passage.　　　　　　　　　　　　　　　　　　　(9)

Q.2.　Write a report on wasteful expenditure on weddings in our society.　　　　　　(9)

OR

Write a report to the Principal of your college about the bad laboratory conditions.

Q.3.　Use appropriate preposition in any FIVE of the following sentences.　　　　　(5)

　　1.　We walked ……… ……………the edge of the desert.
　　2.　It is another three weeks ……… the holidays.
　　3.　All the students will work ………. a collaborative environment.
　　4.　They need to concentrate…………….their studies.
　　5.　They will be placed ………………. a range of community settings.
　　6.　We examined the scientific ……dental practice.
　　7.　They are quite …………………….home in English.

Q.4.　Why has Mark Twain rejected Darwin's theory of evolution and what are his conclusions in this regard?　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(10)

OR

Highlight the importance of native language as presented by Alphonse Daudet?

Q.5.　Describe Russell's views on literary and scientific education.　　　　　　　　(10)

OR

Q.7.　What according to Whyte does the creative imagination do that the conscious mind does not do?

Note: Attempt five question in all, selecting two from Section-I and three from Section-II,

Section-I

Q.1 (a) Solve the inequalities $|2x - 3| \leq 1$ and then show the solution sets as graphs of intervals or union of intervals. (05)

(b) Let $f : R \to R$ defined by $f(x) = \dfrac{a + x}{a - x}$. Find domain and range of the function. (05)

Q.2 (a) Express $-\sqrt{3} - i$ in the polar form and draw its Argand diagram. (05)

(b) Find four fourth roots of $-16i$. (05)

Q.3 (a) Prove that $sin5\theta = 16sin^5\theta - 20sin^3\theta + 5sin\theta$. (05)

(b) Evaluate the sum of the infinite series

$$cos\theta - \frac{1}{2}\,cos2\theta + \frac{1}{3}\,cos3\theta - \frac{1}{4}\,cos4\theta...$$

(05)

Section-II

Q.4 (a) If matrices A and B are conformable for the sum $A + B$, the show that $(AB)^t = B^t A^t$, where A^t stands for transpose of A and so on. (05)

(b) Show that

$$A = \begin{bmatrix} 1 & -2 & -6 \\ -3 & 2 & 9 \\ 2 & 0 & -3 \end{bmatrix}$$

is periodic of period 2. (05)

Q.5 (a) What is rank of a matrix? Find the rank of

$$A = \begin{bmatrix} 5 & 9 & 3 \\ -3 & 5 & 6 \\ -1 & -5 & -3 \end{bmatrix}.$$

(01,04)

(b) For what value of λ the system of linear equations

$$(1 - \lambda)x_1 + x_2 - x_3 = 0$$
$$x_1 - \lambda x_2 - 2x_3 = 0$$
$$x_1 + 2x_2 - \lambda x_3 = 0$$

have nontrivial solutions. Find the solutions. (05)

Q.6 (a) Prove that

$$\begin{vmatrix} 1 & 1 & 1 \\ \alpha & \beta & \gamma \\ \beta\gamma & \gamma\alpha & \alpha\beta \end{vmatrix} = (\alpha - \beta)(\beta - \gamma)(\gamma - \alpha).$$

(05)

(b) Prove that

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$$

(05)

Q.7 (a) Find equation of tangent and normal to the curve $xy = c^2$ at $(cp, c/p)$.　　　(05)

(b) Show that the tangents at the ends of a focal chord of a parabola intersect at right angles on the directrix.

(05)

Q.8 (a) Find the pedal equation of $r^m = a^m \cos m\theta$.　　　(05)

(b) Show that the tangent to the cardioid $r = a(1 + \cos\theta)$ at the points $\theta = 2\pi/3$ is perpendicular to the initial line.

(05)

Subject: General Mathematics (Differential and Integral Calculus) **B.A/ B.Sc Part-I** **Time:** 03Hrs.

Paper: II **Annual 2019** **Max. Marks:** 50

Note: Attempt five question in all, selecting three from Section-I and two from Section-II,

Section-I

Q.1 (a) Evaluate

$$\lim_{x\to\infty} \frac{x^4 - 2x^2 + 6}{x^2 + 7}.$$

(05)

(b) Find c such that the function

$$f(x) = \begin{cases} \dfrac{1 - \sqrt{x}}{x - 1}, & if \ 0 \le x < 1 \\ c, & if \ x = 1 \end{cases}$$

is continuous for all $x \in [0, 1]$. (05)

Q.2 (a) For $\dfrac{x + y}{x - y} = x^2 + y^2$ find $\dfrac{dy}{dx}$. (05)

(b) Evaluate

$$\lim_{x\to 0} \frac{\ln x^2}{\cot x^2}.$$

(05)

Q.3 (a) If $f(x, y) = \dfrac{x^2 + y^2}{x + y}$, then prove that $(f_x - f_y)^2 = 4(1 - f_x - f_y)$. (05)

(b) If $y = \sin(a \arcsin x)$, then show that $(1 - x^2)y^{(n+2)} = (2n + 1)xy^{(n+1)} - (n^2 - a^2)y^{(n)}$. (05)

Q.4 (a) State and prove Cauchy's Mean Value Theorem. (05)

(b) Use the Mean Value Theorem to show that $|\sin x - \sin y| \le |x - y|$ for any real number x, y. (05)

Q.5 (a) Use Taylor's Theorem to prove that
$\ln \sin(x + h) = \ln \sin x + h \cot x - \frac{1}{2}h^2 \csc^2 x + \frac{1}{3}h^3 \cot x \csc^2 x...$ (05)

(b) Find the Maclaurin's expansion with Lagrange's form of remainder after n terms of the function $f(x) = e^x$. (05)

Section-II

Q.6 (a) Evaluate $\displaystyle\int \frac{(2x + 5)}{\sqrt{x^2 + 5x + 7}} \ dx$. (05)

(b) Using Integration by parts evaluate $\displaystyle\int x^4 \ lnx \ dx$. (05)

Q.7 (a) By definition, evaluate $\displaystyle\int_a^b x^2 \ dx$. (05)

(b) Prove that $\displaystyle\int_0^{\pi/4} \frac{x \tan x}{\sec x + \cot x} \ dx = \frac{\pi}{4}$. (05)

Q.8 (a) Evaluate $\displaystyle\int_0^1 xlnx \ dx$. (05)

(b) Using reduction formula evaluate $\displaystyle\int \tan^3 x \sec^5 x \ dx$. (05)

Subject: Statistics	B.A / B.Sc Part-I	Time:03Hrs.
Paper: I	Annual 2019	Max. Marks:40

Note: Attempt **FIVE** Questions in all. Section - **A** is compulsory. Select any **FOUR** Questions from Section - **B**. Use of calculator is allowed.

Section-A

Q.1.   Attempt any Eight parts. (8)

   a) Define Tabulation.   b) What is inferential Statictics?

   c) Under what types of data geometric mean is not preferred?

   d)   Differentiate between Price and Quantity index number.

   e) Give a real life example of positive correlation.   f) What are the sources of secondary data?

   g) Define skewness?   h) Define Harmonic Mean?   i) What is Simple bar Chart?

   j) What is difference between Weighted and Un-weighted Index Numbers?

   k) What is index number?   l) Write down regression model for two independent variables?

Section-B

Q.2.   In a study conducted by the Department of Mechanical Engineering at Virginia Tech, the steel rods supplied by two different companies were compared. Ten sample springs were made out of the steel rods supplied by each company, and a measure of flexibility was recorded for each. The data are as follows:-

Company A: 9.3 , 8.8 , 6.8 , 8.7 , 8.5 , 6.7 , 8.0 , 6.5 , 9.2 , 7.0

Company B: 11 , 9.8,   9.9, 10.2, 10.1, 9.7, 11.0, 11.1, 10.2, 9.6

   (a) Calculate the sample mean and median for the data for the two companies.

   (b) The Loris Healthcare System employees 200 persons on the nursing staff. Fifty are nurse's 50 are Practical nurses and 100 are registered nurses. Nurse's aides receive \$8 an hour, Practical nurses \$15 an hour and registered nurses \$24 an hour. What is the average hour wage? (4+4)

Q.3.   a) Why we need to study measures of dispersions? Discuses its significance importance. (4)

   b) Find the variance and standard deviation of the following data for the marks obtained in a test by 88 students. (4)

Marks (x)	$0 \le x < 10$	$10 \le x < 20$	$20 \le x < 30$	$30 \le x < 40$	$40 \le x < 50$
Frequency (f)	6	16	24	25	17

Q.4.   a) Derive the normal equations for second degree equation. (4)

   b) Fit the curve $y = ab^x$ from the given data
(4)

x	3	5	6	7	10
y	5	7	9	14	15

PTO

Q.5. a) Discuss the real life applications of index numbers. (4)

b) Fruit prices and the amounts consumed for 2000 and 2005 are below. Use 2000 as a base year. Compute Paasches Price Index. (4)

Fruit	2000		2005	
	Price	Quantity	Price	Quantity
Bananas (Pound)	0.23	100	0.35	120
Grapefruit (each)	0.29	50	0.27	55
Apples (Pound)	0.35	85	0.35	85
Strawberries (basket)	1.02	8	1.40	10
Oranges (bag)	0.89	6	0.99	8

Q.6. a) Discuss the components of time series. (4)

b) Compute the seasonal indices for the data using link relative method. (4)

Years	Quarters			
	I	II	III	IV
1994	15.1	15	17.6	15.4
1995	15.9	14.2	18.2	18.3
1996	17.6	18.2	18.2	18.7
1997	17.2	20.3	20.1	21.6

Q.7. a) Define the terms   (i) Regression   (ii) Rank Correlation

(iii) Scatter Diagram   (iv) Negative Correlation   (4+4)

b) Calculate the correlation coefficient between the following variables and interpret the results.

X	2	3	4	5
Y	4	5	6	7

Q.8. We are studying mutual bond funds for the purpose of investing in several funds. For this Particular study we want to focus on the assets of a fund and its year performance. The question is: Can the rate of return be estimated based on the assets of the fund? four mutual funds were selected at random and their assets and rates of return are shown below.

Fund	Assets ($ Millions)	Return (%)
Compass Capital Fixed Income	275.7	11.4
Galaxy Bond Retail	433.2	9.1
MFS Bond A	494.5	11.6
Nichols Income	158.3	9.5

Determine the regression equation and standard error of estimate use assets as the Independent variable (8)

Subject: Statistics   B.A / B.Sc Part-I   Time:03Hrs.
Paper: II   Annual 2019   Max. Marks:40

Note: Attempt FIVE Questions in all. Section-A is compulsory. Select any FOUR Questions from Section - B. Use of calculator is allowed.

Section-A

Q.1. Attempt any Eight parts.   (8)

  a) What is probability distribution?

  b) If 'x' is a random variable then find the probability $\int_0^1 x\dot{2}\, dx$

  c) Write down any two properties of expectation.

  d) Define multiplication rule of counting.

  e) What are the parameters of binomial distribution?

  f) Define hyper geometric distribution

  g) Define Mutually Exclusive Events

  h) Find the probability that $P(Z \leq 2.95)$

  i) Under what condition binomial distribution tends to the binomial distribution

  j) Let 'X' be $B(4,0.25)$ find $P(\,02 \leq x \leq 04)$.

  k) For what purpose we use normal distribution

  l) Write properties of probability density function.

Section-B

Q.2. a) A small town has one fire engine and one ambulance available for emergencies. The probability that the fire engine is available when needed is 0.98, and the probability that the ambulance is available when called is 0.92. In the event of an injury resulting from a burning building, find the probability that both the ambulance and the fire engine will be available, assuming they operate independently.   (4)

b) One bag contains 4 white balls and 3 black balls, and a second bag contains 3 white balls and 5 black balls. One ball is drawn from the first bag and placed unseen in the second bag. What is the probability that a ball now drawn from the second bag is black?   (4)

Q.3. a) What is the probability of getting a total of 7 or 11 when a pair of fair dice is tossed?   (4)

b) John is going to graduate from an industrial engineering department in a university by the end of the semester. After being interviewed at two companies he likes, he assesses that his probability of getting an offer from company A is 0.8, and his probability of getting an offer from company B is 0.6. If he believes that the probability that he will get offers from both companies is 0.5, what is the probability that he will get at least one offer from these two companies?   (4)

Q.4. a) Define the terms (I) probability Distribution functions (II) Random variable (4)

b) Check whether the following is a density function, 'X' is continuous r.v

$$f(x) = \frac{3}{8}(x-2)^2 \quad 0 < x < 2 \quad \text{Also calculate} \quad P(1 < x < 2) \text{ and } P(x > 1.5)$$ (4)

Q.5. a) Suppose that joint distribution of 'x' and 'y' is

$$f(x,y) = x^2 + \frac{1}{3}xy, \ 0 \leq x \leq 1 \ , \ 0 \leq y \leq 2$$

Show that it is complete pdf. Also find f(x). (4)

b) The p.d of discrete r.v 'x' has $f(x) = 3x - 1 \ , 0 < x < 2$ *Find mean and variance*

Q.6. a) Find mean of binomail distribution. (4)

b) The probability that a patient recovers from a rare blood disease is 0.4. If 15 people are known to have contracted this disease, what is the probability that (I) at least 10 survive (II) from 3 to 8 survive, and (III) exactly 5 survive? (4)

Q.7. a) For a certain manufacturing process, it is known that, on the average, 1 in every 100 items is defective. What is the probability that the fifth item inspected is the first defective item found?

b) During a laboratory experiment, the average number of radioactive particles passing through a counter in 1 millisecond is 4. What is the probability that 6 particles enter the counter in a given millisecond? (4+4)

Q.8. a) Write down any four properties of Normal Distribution. (4)

b) An automobile manufacturer introduces a new model that averages 27 miles per gallon in the city. A person who plans to purchase one of these new cars wrote the manufacturer for the details of the tests, and found out that the standard deviation is 3 miles per gallon. Assume that in-city mileage is approximately normally distributed. What is the probability that the person will purchase a car that averages less than 20 miles per gallon for in-city driving? (4)

Note: Attempt **FIVE** questions in all, selecting **THREE** questions from section-A and **TWO** questions from section-B. All questions carry equal marks.

SECTION-A

1. Evaluate the limits

   (a) $\lim_{x \to 0} \dfrac{\csc x - \cot x}{x}$ (b) Find $\lim_{x \to 0} \dfrac{\ln(1 - x^2)}{\ln \cos x}$

2. (a) Is the function $f(x) = (x - a) \sin \dfrac{1}{x - a}$ $x \neq a$
   $$= 0 \qquad x = a$$
   continuous and differentiable at $x = a$?

   (b) Differentiate with respect to x, if $f(x) = \sec^{-1}(\csc x + \sqrt{x})$

3. (a) If $x^y = e^{x - y}$, find $\dfrac{d^n y}{d x^n}$.   (b) If $f(x, y) = \ln \sqrt{x^2 + y^2}$, verify that $\dfrac{\partial^2 f}{\partial x^2} + \dfrac{\partial^2 f}{\partial y^2} = 0$

4. (a) Let a function f be continuous on [a, b] and differentiable on]a, b[, then there exists a point $c \in$]a, b[such that $\dfrac{f(b) - f(a)}{b - a} = f'(c)$

   (b) If $f(x) = x(x - 1)(x - 2)$, $a = 0$, $b = 1/2$; find c of the Mean Value Theorem.

5. (a) Find the Maclaurin's series of the function $f(x) = e^{\sin x}$

   (b) $\lim_{x \to 1}(1 - x) \tan\left(\dfrac{\pi x}{2}\right)$

SECTION-B

6. Evaluate   (a) $\displaystyle\int_{-1}^{5} |x - 2| \, dx$ (b) $\displaystyle\int \dfrac{(2 x^2 - 3x - 3)}{(x - 1)(x^2 - 2x + 5)} dx$

7. Evaluate   (a) $\displaystyle\int x^5 e^{x^3} dx$ (b) $\displaystyle\int \dfrac{dx}{(x^2 + 4x + 5)\sqrt{x + 2}}$

8. Evaluate   (a) $\displaystyle\int_0^{\pi/4} \ln(1 + \tan x) \, dx$ (b) $\displaystyle\int_0^{\infty} \dfrac{dx}{(x^2 + a^2)(x^2 + b^2)}$

Note: Attempt **FIVE** questions in all, selecting **TWO** questions from section-A and **THREE** questions from section-B.

SECTION-A

1. (a) If $Z = x + iy$, then prove that $i = \sqrt{-1}$ and show that $1/i = -i$.   05
    (b) Express the complex number $(-2 + 2i)(1 - i)$ in the polar form.   05

2. (a) Solve the equation $x^6 + 1 = \sqrt{3}\, i$ 05
    (b) If $z = x + iy$, prove that $\tan z = \dfrac{\sin 2x + i \sinh 2y}{\cos 2x + \cosh 2y}$ 05

3. (a) Find the squares of all the 5th roots of $Z = \dfrac{1}{2} + \dfrac{\sqrt{3}}{2} i$ 05
    (b) Evaluate the sum of the infinite series   05
    $$1 + c\cos\theta + \frac{c^2}{2!}\cos 2\theta + \frac{c^3}{3!}\cos 3\theta + \cdots \ldots$$

SECTION-B

4. (a) Examine the equation $2x^2 - xy + 5x - 2y + 2 = 0$ represents a pair of straight lines. If so, find an equation of each straight line.   05
    (b) Find the angle between the pair of lines $3x^2 + 7xy + 2y^2 = 0$ 05

5. (a) Find the pedal equation of the parabola $y^2 = 2a(x + a)$ 05
    (b) Express the equation $r = 1 - \cos\theta$ in rectangular coordinates.   05

6. (a) Show that the points $(3, -1, 3)$, $(1, -1, 2)$, $(2, 1, 0)$ and $(4, 1, 1)$ are the vertices of a rectangle.   05
    (b) If the edges of a rectangular parallelepiped are a, b, c; show that the angles between the four diagonals are given by $\cos^{-1}\left(\dfrac{\pm a^2 \pm b^2 \pm c^2}{a^2 + b^2 + c^2}\right)$.   05

7. (a) Find an equation of the plane through the points $(1, 0, 1)$ and $(2, 2, 1)$ and perpendicular to the plane $x - y - z + 4 = 0$.   05
    (b) Show that the shortest distance between the straight lines   05
    $$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \quad \text{and} \quad \frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5} \quad \text{is} \quad \frac{1}{\sqrt{6}}.$$

8. (a) An equation in cylindrical coordinates is $r^2 \cos 2\theta = z$. Transform the equation into Rectangular coordinates.   05
    (b) Find an equation of the sphere with centre $(2, -1, -1)$ and tangent to the plane $x - 2y + z + 7 = 0$ 05

Subject: Zoology (Biodiversity) B.A/ B.Sc Part-I Time:03Hrs.
Paper: I Annual 2019 Max. Marks:40

Note: Section A is compulsory. Attempt any four questions from Section B.

SECTION-A

Q.1. Write short answers of following Questions. (1×8)

i. What are trichocystes?

ii. Define Tagmatization.

iii. Differentiate between polyp and medusa

iv. Name the classes of Platyhelminthes.

v. What is entercoel hypothesis?

vi. Define metamorphosis.

vii. Define coelom.

viii. What is seclerotization

SECTION-B

Q.2. (a) Describe different types of pseudopodia. (04)

(b) Give an account of reproduction in protozoa. (04)

Q.3. (a) Describe characteristics of members of phylum cnidaria. (04)

(b) Write note on water canal system in sponges. (04)

Q.4. (a) Discuss the life cycle of beef tape worm. (04)

(b) Write note on body wall of turbellarians. (04)

Q.5. (a) Discuss excretion in Nematodes. (04)

(b) Give an account of reproduction and development in Rotifera. (04)

Q.6. (a) Describe general features of cephalopods. (04)

(b) Discuss nutrition in Molluscs. (04)

Q.7. (a) Describe locomotion and burrowing in oligochaetes. (04)

(b) Give an account of feeding and digestion in Annelids. (04)

Q.8. (a) Describe various factors responsible for the success of insects. (04)

(b) Discuss significance of insects for human. (04)

Q.9. (a) Give body characteristics of Echinoidea. (04)

(b) Describe Symmetry and skeleton in Echinoderms. (04)

Subject: Zoology
(Principle of Cell Biology) (Genetics)
Paper: II

B.A/ B.Sc Part-I

Annual 2019

Time: 03 Hrs.

Max. Marks: 40

Note: Attempt Five Questions in all. Section A is compulsory, Attempt four Questions from Section B.

SECTION –A

Q.1. **Do as directed** (08)
   i.   Define Differentially permeable membrane.
   ii.   Define filtration.
   iii. Differentiate between Kinetochore and centromere.
   iv. What do you mean by degeneracy of genetic code.
   v.   Differentiate between mutational equilibrium and mutation pressure.
   vi. What is mosaic evolution.
   vii. Differentiate between hibernation and winter sleep.
   viii. Differentiate Neurotransmitter and Neuropeptide.

SECTION-B

Q.2. (a) Describe activation Energy. (04)

     (b) What are various factor affecting Enzyme activity. (04)

Q.3. (a) Elaborate aerobic respiration with respect to Kerbs cycle. (04)

     (b) Enumurate a balance energy sheet of aerobic respiration encounting Net ATP gain (04)

Q.4. (a) What are various types of learning in animals. (04)

     (b) Discuss various types of communication in animals. (04)

Q.5. Write note on following biochemical elements. (08)

     (a) Carbohydrate   (b)   Proteins

Q.6. Write note on following cellular organelles. (08)

     (a) Golgi apparatus   (b)   Lysosomes

Q.7. (a) What are different types of the mutation in eukaryotes. (04)

     (b) Elaborate Mendle Law of Independent Assortment with Punnet square. (04)

Q.8. (a) Explain Hardy Weinberg Theorem. (04)

     (b) Discuss Natural selection as an evolutionary force. (04)

Q.9. (a) Explain various types of speciation in animals. (04)

     (b) Discuss certain types of interspecific interactions. (04)

Subject: Computer ~~Studies~~
Introduction to Information Technology   **B.A/ B.Sc Part-I**   **Time:** 03Hrs.

Paper: I   **Annual 2019**   **Max. Marks:** 40

Note: Attempt any five questions in all. Section-A is compulsory. Select four questions from Section-B. All questions carry equal marks.

Section-A

Q.1. Write short answers to the following:

    i)   What are the four main parts of computer system?

    ii)   What is the purpose of router?   1

    iii)   Which type of monitor is mostly used with portable computers, Cathode Ray Tube or Flat-panel display?   1

    iv)   Name any two factors affecting processing speed.   1

    v)   One category of common storage devices is magnetic, write names of other two.   1

    vi)   What is the use of Stylus?   1

    vii)   What is meant by word size?   1

    viii)   Give two examples of command line operating systems.   1

Section-B

Q.2.   a. Discuss any two types of computers designed for individual users.   4

       b. Name and differentiate the two main categories of Computer Software.   4

Q.3.   a. Discuss the role of computers in our homes.   6

       b. State any two functions of operating systems.   2

Q.4.   a. State two disadvantages of LCD Monitors.   4

       b. Define resolution and refresh rate of a monitor.   4

Q.5.   a. What is the difference between an impact and a non-impact printer? Give name of one impact and one non-impact printer.   4

       b. List four criteria you should consider while evaluating printers.   4

Q.6.   Why are buses used in a computer? Explain data bus and address bus.   8

Q.7.   Explain how data is stored on the surface of a magnetic disk.   8

Q.8.   a. What are different benefits of using networks?   6

       b. For what purpose Network Interface Card is used.   2

Note: Attempt any five questions in all. Section-A is compulsory. Select four questions from Section-B. All questions carry equal marks.

Section-A

Q.1.   Give short answers to the following. (8)

   a) What do you mean by encapsulation in object-oriented programming.

   b) Write the difference between structure programming and object-oriented programming.

   c) What is the difference between list-box and combo-box.

   d) Just declare a single dimension array in Visual Basic.

   e) What is difference between Do-While and While-Do?

   f) What is Error handling in visual basics and how do we perform it?

   g) What is user defined data types?

   h) Write the name of at-least four different types of variables according to the data types they can handle.

Section-B

Q.2.   Discuss the procedure of creating menu in VB? (8)

Q.3.   What is Event programming? How the mouse over, key down and key up works. Give the example of each of these events. (8)

Q.4.   What is difference between FOR loop and While loop? Narrate it with at last two different examples (8

Q.5.   What is difference between CASE SWITCH statement and IF-THEN-ELSE? Explain your answer with example. (8)

Q.6.   What is the purpose of REPORTS? How we add report to a program? An example required here to elaborate your answer. (8)

Q.7.   Take two different fractional or non-integral values in two text boxes and define a subtract function behind a button to subtract these non-integral values. [Hint: non-integral values mean numbers with both integer and fractional parts.] (8)

Q.8.   How we connect VB form with database? Code a program to store data into database having Student ID (text box), student name (text box), Male/Female (Radio Button). (8)

Q.9.   What are different data types in Visual basics. How we define each of them. Give the example of each one. (8)

Q.10.   Write a program that asks the user to enter 20 numbers from a user and stores these numbers into array. Write   a function that counts the positive number in array. (8)

Subject: B-Course of Mathematics   **B.A/ B.Sc Part-I**   Time:03Hrs.

Group Theory and Linear Algebra

Paper: I   **Annual 2019**   **Max. Marks:50**

Note: Attempt any five questions, two from section-A and three from section-B. Each question carries equally marks.

Section-A

Q.1.   a. Show that the product of two even or two odd permutations is an even permutation

b. Let H, K be two finite subgroups of a group G whose orders are relatively prime. Then $H \cap K = \{e\}$.

Q.2.   a. Find all subgroups of cyclic group of order 12.

b. Show that the only idempotent element of a group G is the identity element.

Q.3.   a. Let G be a group. Show that G is abelian if and only if $(ab)^2 = a^2 b^2$ for all $a, b \in G$.

b. Show that the set $\{\bar{1}, \bar{2}, \bar{4}, \ \bar{5}, \bar{7}, \bar{8}, \}$ under a multiplication modulo 9 is a group.

Section-B

Q.4.   a. Show that $S = \{a + b\sqrt{3}, \ a, b \in Q\}$ with usual addition and multiplication is a field.

b. For two matrices of same order prove that $(A + B)^t = A^t + B^t$.

Q.5.   a. Show that the matrix $\begin{bmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{bmatrix}$ is nilpotent. What is the nilpotency index.

b. Define $T: R^3 \rightarrow R^3$ by $T(x, y, z) = (-z, x, x + z)$. Find $N(T)$ and show that T is one-to-one.

Q.6.   a. By using elementary row operation, find the inverse of the matrix $\begin{bmatrix} 1 & 0 & 3 \\ 2 & 4 & 1 \\ 1 & 3 & 0 \end{bmatrix}$.

b. Show that $W = \{(x, y, z): x, y, z \in Q\}$ is a subspace of R^3.

Q.7.   a. Evaluate the determinant of the matrix $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$.

b. Show that $\{(1, -1, 0), (2, -1, -2), (1, -1, -2)\}$ is a basis of R^3.

Q.8.   a. Find the solution of the following system of linear equations by the Gauss-Jordon elimination methods:

$$2x - y - z = 9$$

$$3x + 4y - 2z = 11$$

$$3x - 2y + 4z = 11$$

b. Show that the $yz-$plane $W = \{(0, y, z): \ y, z \in R\}$ is spanned by $\{(0, 1, 2), (0, 2, 3), \ (0, 3, 1)\}$.

Subject: B-Course of Mathematics   **B.A/ B.Sc Part-I**   Time:03Hrs.

Number Theory, Topology and Inner Product Spaces

Paper: II   **Annual 2019**   Max. Marks:50

Note: Attempt any **five** questions, two from section **A** and three from section **B**. All question carries equal marks.

Section-A

Q.1.   a. Show that $(a - b)\big/(a^n - b^n)$ for all $n (\geq 0) \in Z$.

     b. Prove that every odd integer is of the form $4n - 1$ or $4n + 1$.

Q.2.   a. If p is prime, then the congruence $f(x) \equiv 0 (\mod p)$ of degree n has at the most n solutions.

     b. Prove that the product of any three consecutive integers is divisible by 6.

Q.3.   a. If $d = (a, b)$, then d can be expressed as a linear combination of a,b.

     b. Solve the following system of simultaneous linear congruence

$$3x \equiv 1(\mod 5), 6x \equiv 8(\mod 14).$$

Section-B

Q.4.   a. Let (X, d) be a metric space, show that d_1 defined by

$$d_1 (x, y) = \frac{d(x,y)}{1+d(x,y)} \text{ is a metric space on X.}$$

     b. Prove that a subset of a metric space is open if and only if it is the union of open spheres.

Q.5.   a. Show that a closed ball in a real line R is a closed interval.

     b. For a metric space (X, d), prove that intersection of any number of closed set is closed.

Q.6.   a. Let $X = \{a, b, c, d, e\}$ and $\Im = \{\varphi, \{b\}, \{a, d\}, \{a, b, d\}, \{a, c, d, e\}, X\}$ be a topology on X then for

$$A = \{a, b, c\} \subseteq X, \text{ find } A^o, Ext(A) \text{ and } F_r(A).$$

     b. Show that if A is a subset of a topological space X, then $F_r(A) = \bar{A} - A^o$.

Q.7.   a. Prove that the subspace of a discrete topological space is also discrete space.

     b. If $T: R^2 \rightarrow R^2$, find all eigenvalues and a basis for each Eigen space:

$$T(x, y) = (3x + 3y, x + 5y), \qquad T(x, y) = (x - y).$$

Q.8.   a. Find the eigenvalues and corresponding eigenvectors of the matrix $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$.

     b. Show that $\{(1, -1, 0), (2, -1, -2), (1, -1, -2)\}$ is a basis of R^3. Find an orthonormal basis of R^3 using the Gram-Schmidt Process.

Note: Attempt any five questions in all. Section A is compulsory, attempt any four question from section B. Elaborate your answer with labelled diagram, where necessary.

Q.1.   Briefly answers of the following questions.   08

     i.   Virus and Virion
     ii.   HIV Virus
     iii.   Pathogenicity
     iv.   Cyst and Spore
     v.   Palmella Stage
     vi.   Clamp Connection
     vii.   Perithecium
     viii.   Disease Cycle.

Q.2.   (a). What are Viruses? Discuss replication in viruses.   04

       (b). Draw neat diagram of generalized bacterial cell.   04

Q.3.   (a).Write a note on sexual reproduction in Chara.   04

       (b). Write a note on thallus structure of Vaucheria.   04

Q.4.   (a). Give general characteristics and economic importance of Diatom.   04

       (b) Describe the structure of Physcia with the help of diagram.   04

Q.5.   (a). Describe structure and life cycle of Pencillium.   04

       (b). Discuss the role of fungi in agriculture.   04

Q.6.   (a). Describe the structure and development of sporophyte in Anthoceros.   04

       (b). Discuss affinities of Bryophytes.   04

Q.7.   Discuss in details stellar system within Pteridophytes.   08

Q.8.   Describe the structure and development of male and female cone of Cycas.   08

Q-9.   (a). Discuss general characteristics of Angiosperm.   05

       (b). What is the significance of "Double fertilization".   03

Subject: Botany (Plant Systematics, Anatomy and Development)

Paper: II

B.A/ B.Sc Part-I

Annual 2019

Time: 03 Hrs.

Max. Marks:40

Note: Attempt five questions in all. Section A is compulsory, attempt any four questionfrom section B. Elaborate your answer with labelled diagram, where necessary.

Q.1. Discus the following question briefly (08)

    i. Define BATERIOLOGY?
    ii. Differentiate between Plant Systematic and Taxonomy.
    iii. Differentiate between Primary and Secondary growth.
    iv. Differentiate between stilt and prop root.
    v. Differentiate between Berry and Drupe.

Q.2. Discuss Engler and Prantels system of classification with reference to its merits and demerits. (08)

Q.3. Discuss Racemose inflorescence in detail. (08)

Q.4. Discuss Binomial Nomenclature with reference to rules of ICBN. (08)

Q.5. Draw floral formula and floral diagram of family Asteraceae with reference to its economic importance. (08)

Q.6. a) Write down characteristics feature of family Poaceae. (04)

    b) Write down five botanically important genera of family Poaceae. (04)

Q.7. Write an essay on location structure and function of Sclerenchyma. (08)

Q.8. Write down Physico- chemical properties of cell wall. (08)

Q.9. a) Differentiate vascular bundles of Dicot and Monocot stem. (04)

    b) Describe internal structure of monocot leaf (04)

Subject: Chemistry (Organic Chemistry) B.A / B.Sc Part-I Time: 03Hrs.
Paper: I   Annual 2019   Max. Marks: 40

Note: Attempt FIVE Questions. Section A is Compulsory, attempt two from Section B and two from Section C. Each question carries 8 marks.

Section A

Q.1. Attempt the following questions.
  I. What is basic condition for any compound to show aromaticity?
  II. Give general formula for cyclic alkane.
  III. Why Nitro is electron withdrawing and hydroxyl is electron donating group?
  IV. Which bond is required to transmit the Field Effect in organic compounds.
  V. Why I is a good nucleophile and poor base?
  VI. Which is more oxidized; ketone vs aldehyde?
  VII. Give the formula of amide.
  VIII. Give the formula of Pyrrole.

Section B

Q.2. a) Differentiate the atomic orbital from molecular orbitals, with an appropriate example.
  b) What is hybridization? Give the bond angles and bond lengths for different hybridized forms of C.

Q.3. a) write five forms of pure hydrocarbons and Give the structure of 3,4-dinitro-4-Chlorooctane.
  b) Give the reaction to prepare Grignard reagent from benzyl chloride.

Q.4. a) Give Wolf and Clemnson reduction reactions.
  b) what is distereoisomer and anantiomer? take any compound to elaborate it.

Q.5. a) Give two electrophilic substitution reactions for aromatic compounds.
  b) Give two preparative reactions for the preparation of ketones.

Section C

6. a) what is difference between SN1 and SN2 reactions with reference to order, steps and stereo outcomes.
  b) How chloroform give alpha elimination and 2-chlorbutane beta elimination reaction?

Q.7. a) If you react chloroacetic acid and acetoyl chloride, which one will be used to produce a nucleophile give the reaction.
  b) what is Morkonikoff rule? give two examples to understand it.

Q.8. a) Express Oppenaur oxidation and pinacol pinacolon rearrangement reaction.
  b) Give Cannizaro reaction in aldol condensation.

Q.9. a) Give the simple tests for alkane and alkenes.
  b) What are IUPAC rule for the nomenclature of alkene and alcohol?

Subject: Chemistry
(Applied Chemistry)

Paper: II

B.A/ B.Sc Part-I

Annual 2019

Time:03Hrs.

Max. Marks:40

Note: Attempt five questions in all. Section-I is compulsory, select two questions each from section II and III. All question carry equal marks. Each part in section II and III carries 4 marks.

Section I

Q.1. Define and do as directed any eight parts:

i. Forth flotation Method
ii. Smelting
iii. Specific conductance
iv. Chrome plating
v. Absolute alcohol
vi. Pyrex glass
vii. Hypochromic Effect
viii. Fundamental vibration
ix. Liquid Crystal
x. Composite material

Section II

Q.2. a) Differentiate and explain nuclear fission and fusion reaction with example?

b) Discuss different applications of radionuclide?

Q.3. a) State Ohm's law and explain the various terms involved?

b) Explain the variation of specific and equivalent conductance with dilution?

Q.4. a) Discuss the important applications of colloids in daily life?

b) Discuss the origin of charge on colloidal particles. How would you determine the charge on colloidal?

Q.5. a) What is Portland cement? How it is manufactured?

b) Give the detail extraction of copper from its oresand how it is refined?

Section III

Q.6. a) What is meant by glass? Give its general composition and manufacturing process.

b) What is melamine formaldehyde resin? Give its preparation and uses.

Q.7. a) What are phosphazenes? How are they prepared? Give their properties.

b) What is fertilizer? Give the industrial manufacture of urea.

Q.8. a) What is phosphaticfertilizer? Describe the manufacture of triple superphosphate with flow sheet diagram.

b) What raw materials are required for Portland cement? Briefly discuss the wet process for the manufacture of cement

Q.9. a) What do you mean by engineering ceramics? What raw material are used for cermics.

b) Describe the manufacture of alcohol from grapes.

Subject: Physics (Vector Analysis, Mechanics and Theory of Relativity)   **B.A / B.Sc Part-I**   **Time:** 03Hrs.

Paper: I   **Annual 2019**   **Max. Marks:** 40

Note: Attempt Five Questions in all, Section A is Compulsory, Attempt two questions from section and two from section C. Use of cell phone as a calculator is not allowed

Section A

Q.1.   Attempt any four parts

   (2, 2, 2, 2)

(i) A particle has momentum equal to mc, what will its speed?

(ii) What is the weight of freely falling body? Explain.

(iii) At what point or points in its path does a projectile have its minimum speed? its maximum speed?

(iv) Can two vectors having different magnitude be combined to give zero resultant? Can three vectors?

(v) A space ship is moving at 0.86c away from the Earth sends a laser beam signal to earth. The pilot measures the speed v of the laser beam signal to be

(A) $v < c$ (B) $v = c$ (C) $v > c$ (D) $v = 0$

Section B

Q.2.   Discuss projectile motion in detail and derive an expression for the range of the projectile, time of fligh and time required to reach maximum height.   (8)

Q.3.   (a) Describe the law of conservation of momentum with the help of figures.   (3)

   (b) Discuss the applications and importance of Laws of Conservations.   (2)

   (c) Discuss in detail the relationships between linear and angular variables.   (3)

Q.4.   (a) What is rotational motion and discuss its variables.   (4)

   (b) What are relationships between linear and angular variables?   (4)

Q.5.   What are the postulates of the special theory of relativity and discuss in detail the relativity of Time and Length.

   (2,3,3)

Section C

Q.6.   A balloon is ascending at 12.4 m/s at a height of 81.3 m above the ground when a package is dropped.

   (a) With what speed does the package hit the ground?   (4)

   (b) How long did it take to reach the ground?   (4)

Q.7.   A players kicks a ball at an angle $36°$ from horizontal with an initial velocity 15.5 m/s. Assuming that ball is moving in a vertical plane.

   (a) Find the time require to reach maximum height.   (b) Maximum height

   (c) its time of flight and range   (d) its velocity when it strikes the ground.   (2,2,2,2)

Q.8.   What must be the value of speed parameter β if the Lorentz factor γ is to be

   (a) 1.01   (b) 10.0   (c) 100   (d) 1000   (2,2,2,2)

Q.9.   A baseball of 0.14 Kg is moving horizontally at a speed of 42 m/s when it is struck by the bat. It leaves the bat in a direction at angle $\varphi = 35°$ above the incident path and with a speed of 50 m/s (a) Find the impulse of the force exerted on the ball. (b) Assuming that collision lasts for 1.5 ms, what is the average force? (c) Find the change in momentum of the bat.   (8)

Subject: Physics (Waves & Oscillations, Thermodynamics and Statistical Mechanics   **B.A / B.Sc Part-I**   Time: 03Hrs.

Paper: II   **Annual 2019**   Max. Marks: 40

Note: Attempt Five Questions in all, Section A is Compulsory, Attempt two questions from section B and two from section C. Use of cell phone as a calculator is not allowed

Section A

Q-1   Attempt any four parts

(2, 2, 2, 2)

    (i)   What will the value of work down at constant temperature? Explain.

    (ii)   In an Adiabatic process no heat can enter or leave the system, why?

    (iii)   Under what conditions would an ideal heat engine be 100% efficient?

    (iv)   How can experimentally we locate the positions of nodes and antinodes on a string, in air column and on a vibrating surface.

    (v)   How can one create plane waves? And spherical waves?

Section B

Q.2.   (a) What is the Torsional Oscillator, derive an expression for its time period.   (4)
    (b) Discuss Damped Harmonic Motion in detail.   (4)

Q.3.   (a) What is interference of waves and describe its types with the help of diagram.   (4)
    (b) Describe standing waves and resonance with the help of diagrams.   (4)

Q.4.   What is Doppler effect and derive an expression for the apparent change in frequency of the sound when source of sound is moving away from stationary observer and when observer is moving towards stationary source.
(2, 6)

Q.5.   (a) Define first Law of Thermodynamics and discuss that how much work is done at constant volume and pressure.   (4)
    (b) Prove that the Internal Energy of an Ideal Gas depends only on Temperature   (4)

Section C

Q.6.   A uniform disc is pivoted at its rim. Find its period for small oscillation and the length of the equivalent simple pendulum.
(8)

Q.7.   What are the three lowest frequencies for a standing wave on a wire 9.88 m long having a mass of 0.107 Kg, which is stretched under a tension of 236 N?.
(8)

Q.8.   Spherical sound waves are emitted uniformly in all directions from a point source, the radiated power P being 25 W. What are the Intensity and the sound level of the sound wave at a distance $r = 2.5$ m from the source.
(8)

Q.9.   Let 1 Kg of liquid water be converted to steam by boiling at standard atmospheric pressure. The volume changes from an initial value of 1.00×10^{-3} m^3 as a liquid to 1.671 m^3 as steam. For this process Find (a) the work done on the system. (b) the heat added to the system. (c) the change in the internal energy of the system
(8)