F.Y.BSc (Comp. Science) Dec 2019

Con. 579-19. Foundation Course - (I) CD-7118

(3 Hours) [Total Marks : 80

N.B. : (1) **All** questions are **compulsory**.
(2) **Figures** to the **right** indicate **full** marks.

1. Answer any **four** of the following :— 4 x 4
   (a) Forms of violence against women in India.
   (b) Caste system in India.
   (c) Problems of declining sex ratio in India.
   (d) Causes of visual diability.
   (e) Basic features of Indian Constitution.
   (f) Contribution of races to Indian culture.

2. Answer any **four** questions from the following :— 4 x 4
   (a) Regionalism in India.
   (b) State any five fundamental duties of Indian citizen.
   (c) Communalism in India.
   (d) Features of Local Self Government in rural areas.
   (e) Role of women in politics.
   (f) Causes of mental retardation.

3. Answer any **four** questions from the following :— 4 x 4
   (a) Problems of elderly persons.
   (b) Causes and measures to prevent AIDS.
   (c) Child labour is a curse to the society. Discuss.
   (d) Causes and effects of trafficking of women in India.
   (e) Concepts of liberalization and privatization.
   (f) Right to Equality.

4. Answer any **four** questions from the following :— 4 x 4
   (a) Impact of globalization on various sectors.
   (b) Causes and effects of alcoholism.
   (c) Note on four premises of political democracy.
   (d) Prejudices and stereotypes are barriers in the development of an individual. Discuss.
   (e) Causes and measures of stress.
   (f) Agents of socialization.

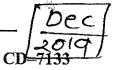5. Answer any **four** questions from the following :— 4 x 4
   (a) Maslow's Theory of Self Actualization.
   (b) Conflict management mechanism.
   (c) Causes and measures to control violence in Indian Society.
   (d) Impact of mass media on culture.
   (e) Forms of environmental degradation.
   (f) Structure and functions of eco-system.

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F.Y.B.Sc (Comp.Science)

P4–Exam-2019-2–148
Con. 585-19.

Mathematics — (P-I)

Dec 2019

CD-7133

(3 Hours) [Total Marks : 100

N.B. : (1) All questions are **compulsory**.

(2) **Figures** to the **right** indicate **full** marks to the subquestions.

(3) From questions **2** to **7**, subquestions **(a)** is **compulsory** and attempt any **one** from **(b)**, **(c)**.

1. Attempt any **one** :

   (a) State and prove Leibnitz Theorem for Derivative & hence find n^{th} derivative of $y = x^3 e^{2x}$.   **10**

   (b) State and prove the Sandwich Theorem and hence find   **10**

   $$\lim_{(x,y) \to (0,0)} x \, Sin\left(\frac{1}{y}\right)$$

2. (a) By using $\in - \delta$ definition prove $\lim_{x \to a} \sin(x) = \sin(a)$.   **8**

   (b) Show that f is discontinuous everywhere in R if   **7**

   $$f(x) \quad = \quad -1 \quad when \quad x \in Q$$
   $$= \quad 1 \quad when \ x \in R\backslash Q$$

   (c) Find the equation of Tangent & Normal for $Y = \dfrac{1}{x+1}$ $at \left(1, \dfrac{1}{2}\right)$.   **7**

3. (a) Find following limits by using Sandwich theorm :   **8**

   (i) $\displaystyle\lim_{x \to \infty}\left(\frac{2x + Cosx}{x + Sinx}\right)$ (ii) $\displaystyle\lim_{x \to \infty}\left(\frac{x - Sinx}{x + Cosx}\right)$

   (b) Discuss the differentiability of $f(x) = x^2|x|$ on $\mathbb{R}$.   **7**

   (c) Find $\dfrac{dy}{dx}$ for $Cos(x + y) = xy$.   **7**

4. (a) If $y = aCos(logx) + bSin(logx)$, where a, b, $\in \mathbb{R}$. Prove that   **8**
   $$x^2 y_{n+2} + (2n + 1)xy_{n+1} + (n^2 + 1)y_n = 0$$

   (b) Find the local maxima and local minima of   **7**
   $f(x) = 3x^4 - 2x^3 - 6x^2 + 6x + 1.$

   (c) Verify Rolle's Theorem if possible for $f(x) = \dfrac{\sin x}{e^x}$ in $[0, \pi]$.   **7**

(2)

[TURN OVER

5.   (a) State Lagrange's Mean Value Theorem and give its geometrical interpretation. If a, b   **8**

are real numbers such that $0 < a < b$ then prove that $1 - \dfrac{a}{b} < \log \dfrac{b}{a} < \dfrac{b}{a} - 1$ and hence

show that $\dfrac{1}{6} < \log \dfrac{6}{5} < \dfrac{1}{5}$.

   (b) Find the intervals in which $f(x) = 3x^5 - 40x^3 + 3x - 20$ is Concave upward and   **7**
      Concave downward.

   (c) Find an acute angle between the vectors $\bar{v} = \hat{i} + 2\hat{j} + 3\hat{k}$ *and* $\bar{w} = \hat{i} + \hat{j} - \hat{k}$. Check   **7**
      whether they are parallel / perpendicular to each other.

6.   (a) Convert into Polar Coordinates and find $\displaystyle \lim_{(x, y) \to (0,0)} Cos\left(\dfrac{x^2 + y^2}{x + y}\right)$.   **8**

   (b) Use two path to show that $\displaystyle \lim_{(x, y) \to (0,0)} \dfrac{y}{x + y}$ doesn't exist.   **7**

   (c) Does the $\displaystyle \lim_{(x,y) \to (0,0)} \dfrac{y^2}{x^4 + 3y}$ exist ? Justify ?   **7**

7.   (a) If $u = x^y$ verify $\dfrac{\partial^2 u}{\partial x \partial y} = \dfrac{\partial^2 u}{\partial y \partial x}$.   **8**

   (b) Find Stationery values of $x^2 + y^2 - z = 0$.   **7**

   (c) If $u = \log(x^2 + y^2)$ find $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2}$.   **7**

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(3 Hours)   [Total Marks : 80

N.B. : (1) **All** questions are **compulsory**.
    (2) **Each** question carries **16** marks.
    (3) **Internal** choices are there in **each** question.
    (4) **Figures** to the **right** indicate **full** marks.

1. Attempt any **four** questions from the following :   **16**
    (a) Find n^{th} derivative of $y = x^3 e^{2x}$.

    (b) Find $\lim\limits_{x \to 0} x^2 Sin\left(\dfrac{1}{x}\right)$

    (c) Discuss the continuity of f on $\mathbb{R}$ if

$$f(x) = 2x^2 - 1 \quad \text{if} \quad x < 0$$
$$\quad\quad = 3x^2 + 1 \quad \text{if} \quad x \geq 0$$

    (d) Find the equation of Tangent & Normal to $x^2 + xy + y^2 = 2$ at $(1, 3)$.

    (e) Find Taylor's series for $f(x) = e^x$ at $x = 0$.

    (f) Find point/s of inflection for $f(x) = 3x^5 - 40x^3 + 3x - 20$.

2. Attempt any **four** questions from the following :   **16**
    (a) Draw graph of the following functions :
        (i) $y = |x + 3|$
        (ii) Ceiling function on $[-2, 2]$

    (b) By using $\in -\delta$ definition prove $\lim\limits_{x \to 2} (2x+1) = 5$.

    (c) Show that $f(x) = 2x^3 - 12x^2 + 41x + 20$ is increasing on $\mathbb{R}$.

    (d) Check the differentiability of f at $x = 0$ if

$$f(x) = x^2 Sin\left(\dfrac{1}{x}\right) \quad \text{if} \quad x \neq 0$$
$$\quad\quad = 0 \quad\quad\quad\quad \text{if} \quad x = 0$$

    (e) Find y_n for $y = \dfrac{1}{x^2 - 3x + 2}$

    (f) Verify Lagrange's mean value theorem for $f(x) = x^2 - x$ in $[0,1]$.

3. Attempt any **four** questions from the following :   **16**
    (a) If f and g are continuous at $x = c$ then prove that $f + g$ is continuous at $x = c$.

    (b) Find equation of a line passing through the points $A \equiv (1, 2, 3)$ and $B \equiv (-1, 0, 2)$.

    (c) Verify Rolle's Theorem for $f(x) = (1 - x^2)e^{(1 - x^2)}$ on $[-1, 1]$.
    (d) Divide 60 in two parts, so that their product is maximum & find the maximum value.
    (e) Find the maximum & minimum values of $f(x) = 2x^3 - 9x^2 + 12x + 15$.
    (f) Prove that every differentiable function is continuous on $\mathbb{R}$.

[**TURN OVER**

4. Attempt any **four** question from the following : 16

    (a)   Find $\lim\limits_{(x,y)\to(0,0)} \cos\left(\dfrac{x^3 - y^3}{x^2 - y^2}\right)$.

    (b)   If $u = \log(x + y)$ find $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2}$.

    (c)   Show that $\lim\limits_{(x,y)\to(0,0)} \dfrac{x^2}{x^2 + y}$ doesn't exist.

    (d)   Find the parametric equation of line passing through point $(1, 2, 3)$ and parallel to $3i + 2j + k$.

    (e)   Derive the Formula for Spherical Coordinate System for any point $P(x, y, z)$ in Cartesian Plane.
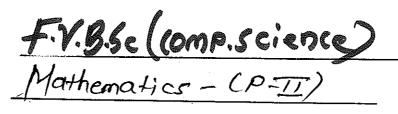
    (f)   Show that angle between any two diagonals of a Cube is $\cos^{-1}\left(\dfrac{1}{3}\right)$.

5. Attempt any **four** questions from the following : 16

    (a)   If $y = x^n \log x$, prove that $y_{n+1} = \dfrac{n!}{x}$.

    (b)   Find the point at which the line $x = 1 + t$, $y = 2$, $z = t$ intersect the plane $x + 2y + z = 3$.

    (c)   Find minimum value of $Z = x^2 + y^2$.

    (d)   State and explain Sandwich theorem for limits of functions of two variables,

    (e)   Use Polar coordinates to evaluate $\lim\limits_{(x,y)\to(0,0)} \dfrac{x^3}{x^2 + y^2}$.

    (f)   Find the intervals in which $f(x) = 3x^2 - 2x^3$ is Concave upward and Concave downward.

F.Y.B.Sc (Comp. science) Jan 2020

Mathematics – (P-II) CD-7135

(3 Hours) [Total Marks : 100

N.B. : (1) **All** questions are **compulsory**.

    (2) **Figures** to the **right** indicate **full** marks to the Subquestions.

    (3) From Question **2** to **7**, Subquestion **(a)** is **compulsory** and Attempt any **two** from **(b)**, **(c)** and **(d)**.

1. Attempt any **One** :—

    (a) Define prime number and a composite number. Prove that there are infinitely   **10** many prime numbers.

    (b) State Extended Pigeon Hole Principle, let $(x_i,\ y_i,\ z_i)$ where   **10** $i = 1, 2, 3, 4, 5, 6, 7, 8, 9$ be a set of nine distinct points with integer coordinates in the xyz space. Show that the midpoint of the line joining at least one pair of these points has integer coordinates.

2. (a) State and prove Division Algorithm for integers.   **7**

    (b) State Pascal's rule and write Pascal's Triangle for n = 4.   **4**

    (c) Find lcm and gcd of 235 and 300.   **4**

    (d) Prove that if a/b & a/c then a/b+c.   **4**

3. (a) Find the number of Surjective functions from n-set to 2-set.   **7**

    (b) Show that the mapping f (x) = 2x+1 from Real numbers to itself is Bijective   **4** & find its inverse.

    (c) If f : IR → IR and g : IR → IR are defined by f(x) = 3x and g(x) = 2x +1   **4** then check whether fog(x) = gof(x).

    (d) Check whether the Operation $a*b = a^2+b^2$ Associative & Commutative on N.   **4**

4. (a) Prove that 7 divides $2222^{5555} + 5555^{2222}$.   **7**

    (b) Show that 89 divides $2^{44} - 1$.   **4**

    (c) How many different arrangements can be made by using all letters of "COFFEE" ?   **4**

    (d) Find last digit of 7^{315} **4**

[**TURN OVER**

5. (a) Define a relation R on Z by aRb if and only if $5 \mid (2a + 3b)$. Check whether 7
R is an equivalence relation. If so, find all the distinct equivalence classes.

(b) Write the $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 2 & 7 & 6 & 5 & 4 & 1 \end{pmatrix}$ as product of disjoint cycles. 4

(c) Let $S = \{a, e, i, o, u\}$. Let $P = \{S_1, S_2\}$ where $S_1 = \{a, u\}$ and $S_2 = \{e, i, o\}$. Prove 4
that P indeed is a partition of the set S. Define an associated equivalence relation
on S.

(d) Write all derangements on $S = \{X, Y, Z\}$. 4

6. (a) Find the number of positive integers between 1 to 1000 which are not divisible by 7
4, 5 or 6.

(b) Find the total number of integer solutions to $x+y+z = 30$. 4

(c) Define irresflexive, Asymmetric relation with examples. 4

(d) Compute S (3, 2). 4

7. (a) Let $f(x) = a_0 + a_1 x + a_2 x^2 + ... + a_n x^n$ in Z[x]. Let p/q be a root of f(x) such that 7
$(p, q) = 1$ then prove that $p \mid a_0$ and $q \mid a_n$.

(b) Find k, if one root of $f(x) = 3x^3 - kx^2 - 7x + 3$, is the reciprocal of another root 4
of f (x).

(c) Find gcd of $f(x) = x^4 - x^2 + x - 1$ and $g(x) = x^3 - x^2 + x - 1$ in Q [x]. 4

(d) Find all solutions of $x^3 + 1 = 0$. 4

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Con. 576-19.   **CD-7135**

(3 Hours)   [Total Marks : 80

N.B. : (1)   **All** questions are **compulsory**.

     (2)   **Each** question carries **16** marks.

     (3)   **Internal** choices are there in **each** question.

     (4)   **Figures** to the **right** indicate **full** marks.

1. Attempt any **four** questions from the following :—   16

    (a) Prove that if a/b then $7^a - 1/7^b - 1$.

    (b) Find $\phi(1200)$.

    (c) Find lcm and gcd of 154 and 231.

    (d) Prove that GCD of two numbers is Unique.

    (e) State Pascal's rule and write Pascal's Triangle for n = 5.

    (f) Find LCM and GCD of 1500 and 225.

2. Attempt any **four** questions from the following :—   16

    (a) Define Bijective function with example.

    (b) Prove that for any three sets A, B & C, $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$.

    (c) Show that the mapping f(x) = 3x+7 from Real numbers to itself is Bijective
       & find its inverse.

    (d) Show that if there are 100 students in a class then there are at least
       4 students whose first name begins with the same alphabet.

    (e) A & B are two finite sets. If $A \subseteq B$ & f from A to B is a surjective map
       then Prove that A = B.

    (f) Check whether the Operation a*b=a+b+3 is Associative & Commutative
       on Z.

[**TURN OVER**

3. Attempt any **four** questions from the following :—   16

   (a) If a, b, c, d are integers & n is fixed positive integer then if $a \equiv b \pmod{n}$ & $c \equiv d \pmod{n}$ then $a-c \equiv b-d \pmod{n}$.

   (b) Find last digit of 7^{531}.

   (c) Slove the Equation $17x \equiv 9 \pmod{276}$

   (d) Show that 41 divides $2^{20} - 1$.

   (e) Prove that $10! \equiv -1 \pmod{11}$

   (f) State and prove Euclid's theorem.

4. Attempt any **four** questions from the following :—   16

   (a) In Z, R defined by xRy iff $2x + 3y$ is divisible by 5, Prove that R is an equivalence relation.

   (b) Write all Permutations on S = { 1, 2, 3 }.

   (c) How many different letters words can be formed by using the letters of "BOOSSSOOII".

   (d) Find the total number of integer solutions to $x_1+x_2+x_3 = 20$.

   (e) Find the number of positive integers between 1 to 200 which are not divisible by 2 or 3.

   (f) Write the following permutation as product of transpositions.
   $$\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 4 & 7 & 6 & 1 & 5 & 3 \end{pmatrix}$$

5. Attempt any **four** questions from the following :—   16

   (a) Find all solutions of $x^3+1= 0$.

   (b) Find gcd of $f(x) = x^4 - x^2 + x - 1$ and $g(x) = x^3 - x^2 + x - 1$ in Q [x].

   (c) Using De Moivre's Theorem, find x^{20} if $x = (1 - i)$.

   (d) Prove that n^{th} roots of unity are in G.P.

   (e) State and explain Rational Roots theorem with example.

   (f) Find all fourth roots of 1.

F.Y.B.Sc (Comp. Science)

Physics - (Paper - I)

Jan 2020

P4–Exam-2019-2-159

Con. 597–19.

CD–7147

(2 Hours)

[Total Marks : 60

N.B. : (1) **All** questions are **compulsory**.
    (2) **Figures** to the **right** indicate **full** marks.
    (3) Use of **scientific** calculator is **allowed**.

1. (a) Attempt any **One** of the following :   **7**
    (i) Define viscosity. Write its units and dimension. Derive continuity equation.
    (ii) Show that $Y = 2\eta (1 + \sigma)$ Where symbols have their usual meanings.

  (b) Attempt any **One** of the following :   **3**
    (i) Two wires of the same material are subjected to the same tension. Compare the extensions produced in the length of the first wire is double that of the other and its radius is half of that of the other.
    (ii) A wooden block of mass M kg is placed on an inclined plane at an angle θ the angle is adjusted such that the block moves downwards with constant speed. Find the angle in terms of coefficient of friction.

2 (a) Attempt any **One** of the following :   **7**
    (i) Derive Mayer's relation, relating two specific heats of a perfect gas.
    (ii) Derive an expression for the work done by a perfect gas in an isothermal change.

  (b) Attempt any **One** of the following :   **3**
    (i) Explain the zeroth law of thermodynamics.
    (ii) Explain free expansion of Gas by Joule's law.

3. (a) Attempt any **One** of the following.   **7**
    (i) Explain how ultrasonic waves are detected by magnetostriction method?
    (ii) Show that the velocity of acoustic wave is independent of a gas pressure and varies as $\sqrt{T}$.

  (b) Attempt any **One** of the following :   **3**
    (i) A wave on a string is described as $Y = 0.1 \cos (10 t + 2x)$ Find the amplitude, frequency and wavelength.
    (ii) An auditorium has volume 5000 m^3 It has reverberation time of 2 sec. What should be the total absorption in the auditorium?

4. (a) Attempt any **One** of the following :   **7**
    (i) Two collinear SHM's are represented as $Y_1 = a \cos \cos (\omega t - \alpha)$ and $Y_2 = a \cos \cos (\omega t - \beta)$ Show that resultant amplitude is minimum.
    (ii) There are N particles of N masses with position vectors $r_1 \, r_2 ,............ r_N$. Derive the expression for the conservation of angular momentum.

[TURN OVER

  (b) Attempt any **One** of the following :   **3**

      (i) Two particles of mass 1 kg and 5 kg are at $5\hat{i}-2\hat{j}+3\hat{k}$ and $-5\hat{i}+2\hat{j}-3\hat{k}$ Find the position of the centre of mass.

      (ii) Two SHM's have same period different amplitudes. Draw Lissajous figures when phase difference is 90 and 180 degrees.

5. (a) Attempt any **One** of the following :   **7**

      (i) What is chromatic aberration? Derive necessary expression for it.

      (ii) Show that the radius of Newton's ring is directly proportional to the square root of natural number.

  (b) Attempt any **One** of the following :   **3**

      (i) Determine the focal length of the thick lens having thickness 5 cm and radii of curvature are 10 cm and 8 cm R. I. = 1.5

      (ii) Explain (a) Focal point and (b) Nodal point

6. (a) Attempt any **One** of the following :   **7**

      (i) Explain the construction and Working of He-Ne LASER.

      (ii) What is the numerical aperture for the fiber optics ? Deduce the expression for it.

  (b) Attempt any **One** of the following :   **3**

      (i) Explain in brief step- index optical fiber.

      (ii) Explain two properties of LASER.

(2 Hours)   [Total Marks : 48

N.B. : (1) All questions are **compulsory**.
     (2) **Figures** to the **right** indicate **full** marks.
     (3) Use of **scientific** calculator is **allowed**.

1. Attempt Any **Two** of the following :   **8**
   (a) A bullet of mass 10 gm is fired horizontally and remains imbedded in a mass of 2 kg suspended by the long string. The first swing after impact raises the center of gravity of the combined mass through a height of 15 cm. Calculate the velocity of the bullet.
   (b) Explain modulus of rigidity with suitable diagram.
   (c) Obtain the equation of continuity in case of fluids.
   (d) What is Poisson's ratio? Explain with the help of diagram.

2. Attempt any **Two** of the following :   **10**
   (a) Prove that for the perfect gas $C_p - C_v = R$; where symbols have their usual meanings.
   (b) Discuss the concept of internal energy. Obtain the first law of thermodynamics and discuss path dependence of heat.
   (c) Explain the use of optical fiber in digital communication system.
   (d) Explain the following phenomenon in case of LASER (1) Absorption (2) Spontaneous emission (3) stimulated emission.

3. Attempt any **Two** of the following :   **10**
   (a) Show that the velocity of acoustic wave is independent of a gas pressure and varies as $\sqrt{T}$.
   (b) Explain the acoustic diffraction method for the detection of the ultrasonic waves.
   (c) Define the term absorption coefficient. Derive the formula to measure it.
   (d) What is the frequency of the fundamental note emitted by the crystal if vibrating length is 2mm Young's modulus is 6×10^{11} N/m². Density of the crystal= 3 gm/cc.

4. Attempt any **Two** of the following :   **10**
   (a) Discuss the composition of two collinear SHMs.
   (b) What are Lissajous figures? Illustrate with the example.
   (c) Discuss the law of conservation of total energy of a system of particles.
   (d) Prove that to accelerate a rocket initially at rest to a velocity equal to its ejection velocity u, one must arrange to eject all but a fraction 1/e of its original mass.

5. Attempt any **Two** of the following :   **10**
   (a) Write a short note on cardinal points of a system of lenses.
   (b) Explain the construction of the simple table spectrometer.
   (c) Calculate the wavelength of light incident normally on a wedge-shaped film of glass of R.I. = 1.5. The angle of the wedge is 30 seconds of an arc and the fringe width is of the order of 0.15 cm.
   (d) Explain the phenomenon of interference by reflected light in thin films.

Con. 598–19.   (REVISED COURSE)   CD–7226

(2 Hours)   [Total Marks : 48

N.B. : (1) **All** questions are **compulsory**.
    (2) Figures to the **right** indicate **full** marks.
    (3) Use of **scientific** calculator is allowed.

1. Attempt any **two** of the following :—   **8**
    (a) Derive an expression for the growth of a d.c. current in series L-R circuit.
    (b) State and explain law of Moseley's.
    (c) Obtain a balancing condition of a De-sautey's bridge.
    (d) 5g of Radium is reduced by 10.5 mg in 5 years. Find the half-life time a radium.

2. Attempt any **two** of the following :—   **10**
    (a) With the help of graphs, explain the d.c. potential difference across C and R during charging and discharging.
    (b) A d.c voltage of 80 V is applied across a series combination of 5Ω resistance and 20 H inductance. Find the rate of growth of current at the instant when the current is 6A.
    (c) Explain the parallel L-C-R resonance.
    (d) Draw a phasor diagram to explain the working of only resistance and capacitor connected to A.C voltage.

3. Attempt any **two** of the following :—   **10**
    (a) Explain Half-adder. Draw logic diagram. Write it's truth-table.
    (b) Write a note on transistor as an amplifier.
    (c) Discuss the concept of voltage regulation by means of a block diagram.
    (d) Compare NAND and NOR gates.

4. Attempt any **two** of the following :—   **10**
    (a) State and prove the Maximum Power transfer theorem.
    (b) Wien bridge is balanced; if $C_1 = C_2 = 0.0\mu F$ and $R_1 = R_2 = 10K$. What is the frequency of the bridge?
    (c) Distinguish between Ballistic and dead beat galvanometer.
    (d) Define Voltage and Charge sensitivity. Write their equations and units.

5. Attempt any **two** of the following :—   **10**
    (a) Explain Rutherford's nuclear atom model.
    (b) What is the frequency of the X-ray photon when it's momentum is 1.1×10^{-23} kgm/sec.? [c = 3×10^8 m/s, h = 6.623×10^{-23} j-s]
    (c) Explain working of Bragg's X-ray diffractometer.
    (d) State and explain de Broglie hypothesis.

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Con. 598–19.   (OLD COURSE)   CD–7226

(2 Hours)   [Total Marks : 60

N.B. : (1)   **All** questions are **compulsory**.

(2)   Figures to the **right** indicate **full** marks.

(3)   Use of **scientific** calculator is allowed.

1. (a) Attempt any **ONE** :—   7

   (i)   A source of e.m.f. E is connected across a series combination of capacitor, resistor. Show that the current decays exponentially.

   (ii)   Draw phase diagram to explain the series L-C-R for A.C. voltage.

   (b) Attempt any **ONE** :—   3

   (i)   An inductance of 4H is in series with 1Ω with a d.c. source of 6V. Find the Time constant.

   (ii)   Calculate the resonant frequency for a 0.25 µH inductor, 2pF capacitor.

2. (a) Attempt any **ONE** :—   7

   (i)   Explain the construction and working of a Coolidge tube.

   (ii)   Write a note on the Rutherford's nuclear atom model.

   (b) Attempt any **ONE** :—   3

   (i)   Draw Lymmen and Balmer series.

   (ii)   Draw Bragg's X-ray diffracometer.

3. (a) Attempt any **ONE** :—   7

   (i)   Explain Full adder. Draw a logic diagram. Write truth-table.

   (ii)   Explain the construction and working of a half-wave rectifier.

   (b) Attempt any **ONE** :—   3

   (i)   Draw logic symbol of NAND-gate. Write it' truth-table.

   (ii)   Find the load regulation if V_{NL} = 9V and V_{FL} = 8.8 V.

4. (a) Attempt any ONE :—   7

    (i) State and explain Maximum Power Transfer theorem.

    (ii) For D'arsenal galvanometer show that the coil current is proportional to the angle of deflection.

(b) Attempt any ONE :—   3

    (i) In a De-Sauty's bridge; find the capacitance of the unknown capacitor if $R_2 = 2K$, $R_1 = 1.5K$ and $C_2 = 0.33 \mu F$.

    (ii) Define i) Voltage and Current sensitivity.

          ii) Period of oscillation for M.C.G.

5. (a) Attempt any ONE :—   7

    (i) For nucleus explain Atomic Number, Nuclear Spin and Mass Number, And β–decay.

    (ii) Derive an expression for half-life time.

(b) Attempt any ONE :—   3

    (i) Write a note on NMR.

    (ii) Discuss the process Radiometric dating.

6. (a) Attempt any ONE :—   7

    (i) What is gravitational red shift ?

    (ii) Give the experimental analysis of Compton effect with the help of a neat diagram.

(b) Attempt any ONE :—   3

    (i) State de Broglie hypothesis.

    (ii) The frequency of a photon is 4.97×10^{18} Hz, What is the momentum of a photon? ($C = 3 \times 10^8$ m/s, $h = 6.63 \times 10^{-34}$ J.s)

15

(2 Hours)   [Total Marks : 48

N.B. : (1) All questions are **compulsory**.

      (2) All questions carry **equal** marks.

      (3) Draw **diagrams** wherever **necessary**.

Section I

1. Attempt the following (Any **two**) :—   8

    (a) Draw and explain the block diagram of computer.

    (b) What is Hexadecimal number system ? Convert $(BC)_{16}$ into Decimal & Octal number.

    (c) Write a short note on RS Flip Flop.

    (d) Perform the following binary subtractions using 1's & 2's complement separately.

        (i) (111101 – 10010)

        (ii) (1101101 – 10101)

2. Attempt the following (Any **two**) :—   8

    (a) Explain full adder circuit and explain with example.

    (b) Explain NAND and NOT with the circuit diagram and truth table.

    (c) Draw and explain Basic Logic gates. Write their truth tables.

    (d) What is multiplexer ? Explain operation of 4 : 1 mux.

3. Attempt the following (Any **two**) :—   8

    (a) Explain Instruction Cycle and Instruction pipelining.

    (b) Write a short note on floppy Disk.

    (c) Explain SRAM and DRAM.

    (d) Draw Block diagram of CPU and discuss its functions.

[TURN OVER

16

Section II

4. Attempt the following (Any **two**) :—   8
    (a) Write a short note on Direct Mapping.
    (b) Write the difference between Random Access Memory and Serially Access Memory.
    (c) Write a short note on RAID memory.
    (d) What is I/O module ? Discuss its memory organization.

5. Attempt the following (Any **two**) :—   8
    (a) What is Operating System ? Explain its types.
    (b) Write a short note on Paging technique.
    (c) Explain Interrupt Driven I/O module.
    (d) Explain characteristics of multiprocessors.

6. Attempt the following (Any **two**) :—   8
    (a) Draw a neat block diagram of 8086 microprocessor.
    (b) Short note on Multiport memory.
    (c) Explain Segment register and Data register of 8086 microprocessors.
    (d) Write an 8085 program to add two 8 bit numbers.

Con. 578-19.   CD-7142

<div align="center">(2 Hours)   [Total Marks : 60</div>

N.B. : (1)   All questions are **compulsory**.

     (2)   All questions carry **equal** marks.

     (3)   Draw **diagrams** wherever **necessary**.

<div align="center">**Section I**</div>

1. Attempt the following (Any **two**) :—   10

    (a) Draw and explain the block diagram of computer.

    (b) What is Hexadecimal number system ? Convert $(BC)_{16}$ into Decimal & Octal number.

    (c) Perform the following binary subtractions using 1's & 2's complement separately.

      (i) (111101 − 10010)

      (ii) (1101101 − 10101)

2. Attempt the following (Any **two**) :—   10

    (a) Explain full adder circuit and explain with example.

    (b) Explain NAND and NOT with the circuit diagram and truth table.

    (c) Draw and explain Basic Logic gates. Write their truth tables.

3. Attempt the following (Any **two**) :—   10

    (a) Explain Instruction Cycle and Instruction pipelining.

    (b) Explain SRAM and DRAM.

    (c) Draw Block diagram of CPU and discuss its functions.

[**TURN OVER**

Section II

4. Attempt the following (Any **two**) :— 10

    (a) Write a short note on Direct Mapping.

    (b) Write the difference between Random Access Memory and Serially Access Memory.

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5. Attempt the following (Any **two**) :— 10

    (a) What is Operating System ? Explain its types.

    (b) Explain Interrupt Driven I/O module.

    (c) Explain characteristics of multiprocessors.

6. Attempt the following (Any **two**) :— 10

    (a) Draw a neat block diagram of 8086 microprocessor.

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P4–Exam-2019-2–152
Con. 577–19. Computer Science – (Paper - II)   CD–7153

(2 Hours)   [Total Marks : 48

N.B. : (1) **All** questions are **compulsory**.
     (2) **Figures** to the **right** indicate marks.
     (3) **Mixing** of **sub-questions** is not **allowed**.

SECTION I

1. **Attempt the following : (Any two)**   8
   (a) Define Variables and constant in C? Explain Data types in C.
   (b) Write an algorithm to find the sum & average of 5 numbers.
   (c) Explain Best, Worst & Average case complexity with respect to bubble sort algorithm.
   (d) Identify Time complexity of the given code snippet.
   ```
   int count = 0 ;
   for (int i = 0 ; i < N ; i ++)
   for (int j = 0 ; j < I ; j ++)
   count ++ ;
   ```

2. **Attempt the following : (Any two)**   8
   (a) What are ternary operators? Explain with example.
   (b) Explain arithmetic & relational operators with examples.
   (c) Explain the concept of While loop with Example.
   (d) Explain following functions:
       printf(), scanf(), getch(), gets(), getc().

3. **Attempt the following : (Any two)**   8
   (a) Write a program to count number of vowels in a given string.
   (b) Explain two-dimensional arrays with example.
   (c) What is Array? Explain One dimensional and multi-dimensional array.
   (d) Write a program for addition of two numbers using structures.

SECTION II

4. **Attempt the following : (Any two)**   8
   (a) Write a program to find the factorial of a number using recursion.
   (b) Define function with its syntax and example.
   (c) Write a short note on Structure.
   (d) Write a short note on Algorithm efficiency.

5. **Attempt the following : (Any two)**   8
   (a) Explain how pointer variables are assigned and accessed.
   (b) Explain the following functions:
       fputs(), fclose(), fwrite(), fread().
   (c) Write a program to delete a specific line from text file.
   (d) Explain with an example, the syntax of opening & closing a file in C.

6. **Attempt the following : (Any two)**   8
   (a) Define Queue write an algorithm to insert and delete an element from queue.
   (b) Explain insertion and deletion of a node from linked list.
   (c) How to represent linked list in memory?
   (d) Differentiate between LIFO and FIFOList

[TURN OVER

(2 Hours)   [Total Marks : 60

N.B. : (1) **All** questions are **compulsory.**

      (2) **Figures** to the **right** indicate marks.

      (3) **Mixing** of **sub-questions** is not **allowed.**

SECTION I

1. **Attempt the following : (Any two)**   10
   - (a) Define Variables and constant in C? Explain Data types in C.
   - (b) Explain Best, Worst & Average case complexity with respect to bubble sort algorithm.
   - (c) Identify Time complexity of the given code snippet.
     ```
     int count = 0 ;
     for (int i = 0 ; i < N ; i ++)
     for (int j = O ; j < I ; j ++)
     count++ ;
     ```

2. **Attempt the following : (Any two)**   10
   - (a) What are ternary operators? Explain with example.
   - (b) Explain arithmetic & relational operators with examples.
   - (c) Explain following functions:
     printf(), scanf(), getch(), gets(), getc().

3. **Attempt the following : (Any two)**   10
   - (a) Write a program to count number of vowels in a given string.
   - (b) What is Array? Explain One dimensional and multi-dimensional array.
   - (c) Write a program for addition of two numbers using structures.

SECTION-II

4. **Attempt the following : (Any two)**   10
   - (a) Write a program to find the factorial of a number using recursion.
   - (b) Define function with its syntax and example.
   - (c) Write a short note on Algorithm efficiency.

5. **Attempt the following : (Any two)**   10
   - (a) Explain the following functions:
     fputs(), fclose(), fwrite(), fread().
   - (b) Write a program to delete a specific line from text file.
   - (c) Explain with an example, the syntax of opening & closing a file in C.

6. **Attempt the following : (Any two)**   10
   - (a) Define Queue write an algorithm to insert and delete an element from queue.
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   - (c) Differentiate between LIFO and FIFO List.

F.Y.B.Sc (comp Scien

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