

- Note: 1) All questions are Compulsory.
2) Figures to the right indicate full marks.

- Q1. Answer **any four** questions from the following: (4x4)
- What are the different types of violence against women in India?
 - Discuss the caste system in India
 - What is the positive role of media in India?
 - Discuss the problems of declining sex ratio in India.
 - What are the causes of visual disability?
 - What are the causes of inter-group conflicts?
 - What is the contribution of races to Indian culture?
- Q2. Answer **any four** questions from the following: (4x4)
- Elaborate the characteristic features of Indian Constitution.
 - State any five fundamental duties of Indian citizen.
 - Discuss the causes of mental retardation.
 - What are the features of Local Self Government in rural areas?
 - Discuss the role of women in politics.
 - Discuss regionalism in India.
- Q3. Answer **any four** questions from the following: (4x4)
- What are the causes and measures to prevent AIDS.
 - Child labour is a curse to the society. Discuss.
 - What are the causes and problems of elderly persons?
 - What are the causes and effects of trafficking of women in India?
 - Discuss the concepts of liberalization and privatization.
 - Write a note on Right to Equality.
- Q4. Answer **any four** questions from the following: (4x4)
- What is the impact of globalization on various sectors?
 - Discuss the causes and effects of alcoholism.
 - Write a note on Agents of socialization.
 - Prejudices and stereotypes are barriers in the development of an individual. Discuss.
 - What are the causes of stress and suggest measures to overcome the same?
 - Write a note on four premises of political democracy?
- Q5. Answer **any four** questions from the following: (4x4)
- Discuss Maslow's Theory of Self Actualization.
 - What is a conflict management mechanism?
 - Discuss the impact of mass media on culture.
 - What are the causes and measures to control violence in Indian society?
 - Discuss the different forms of environmental degradation.
 - Describe the structure and functions of eco-system.

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Q1. "India is a multi-religious and multi-cultural nation". Discuss. 15
Or

Write short notes on each of the following:

- a) Positive role of media.
- b) Violence against women.
- c) Causes of visually blindness.

Q2. What are the salient features of Indian Constitution? Describe with illustrations. 15
Or

Write short notes on each of the following:

- a) State any five fundamental duties of Indian citizen.
- b) Regionalism in India.
- c) The problems of declining sex ratio in India.

Q3. Discuss the problems of elderly in India and also suggest measures to solve them. 20
Or

Write notes on each of the following:

- a) Causes and measures to prevent AIDS.
- b) Problem of child labour in India.

Q4. Explain the concept of 'globalization' and its impact on various sectors. 15
Or

Write short notes on each of the following:

- a) Right to Liberty.
- b) Philosophy of Human Rights.
- c) The Universal Declaration of Human rights.

Q5. Discuss the causes and effects of environmental degradation. 15
Or

Write short notes on each of the following:

- a) Causes of stress.
- b) Impact of mass media on culture.
- c) Agents of socialization.

Q6. Explain in detail the conflict management mechanisms. 20
Or

Write short notes on each of the following:

- a) Maslow's Theory of Actualization.
- b) Impact of urbanization on society.

Con. : 292-19.

(3 Hours)

OR-7012

Total Marks : 100

N.B.i) All questions are compulsory.

ii) Figures to the right indicates full marks.

1 Attempt any one of the following:

i) State and prove Lagrange's Mean Value theorem. (10)

ii) If $f: \mathbb{R} \rightarrow \mathbb{R}$ is continuous at $x = 0$ and $f(x+y) = f(x) + f(y)$ for all $x, y \in \mathbb{R}$. Then prove that f is continuous on \mathbb{R} . (10)

Qu-2 Attempt any three of the following:

a) Prove that $|x+y|^2 = (x+y)^2$ for all real values x and y . (5)

b) Check whether the following functions are even or odd or neither. i) $f(x) = x^4 - x^2 + 1$ ii) $f(x) = x + \sin x$ (5)

c) Draw the graph of function $f(x) = \sqrt{x}$. Choose appropriate domain. (5)

d) Use $\epsilon - \delta$ definition to prove that $\lim_{x \rightarrow \sqrt{3}} (x^2) = 3$ (5)

e) Discuss the continuity of the function in the domain $[0, 3]$ (5)

$$f(x) = \frac{\sqrt{x^2+5}-3}{x-2} \text{ at } x \neq 2$$

$$= 1 \text{ at } x = 2$$

Qu-3 Attempt any three of the following:

a) Find the tangent and normal to the curve $x^2 + xy - y^2 = 1$ at a point $(2, 3)$. (5)

b) If $y = \frac{1}{ax+b}$ then prove that $y_n = \frac{(-1)^n n! a^n}{(ax+b)^{n+1}}$ (5)

c) Check the following function for differentiability on \mathbb{R} .

$$f(x) = 3x + 2 \quad x \leq 1$$

$$= 5x - 2 \quad x > 1 \quad \text{span style="float: right;">(5)}$$

(Turn over)

d) If $y = \tan^{-1}x$ then prove that

i) $(1+x^2) y_1 = 1$ ii) $(1+x^2) y_{n+1} + 2nx y_n + n(n-1) y_{n-1} = 0$ (5)

Qu-4 Attempt any three of the following:

a) Verify Rolle's mean value theorem for x^2 in $[-1, 1]$ (5)

b) Find the Taylor's Polynomial for the function $f(x) = \sin x$ at $a = \frac{\pi}{2}$ and $n = 3$ (5)

c) Plot the graph using derivative of the function f if $f(x) = x^4$ (5)

d) Find the asymptotes of the function $y = \frac{2x+3}{3x-2}$ (5)

Qu-5 Attempt any three of the following:

(15)

a) Find the area of the parallelogram formed by \overline{AB} and \overline{AC} if $A = (2, 1, 2)$, $B = (3, 2, 1)$ and $C = (5, 5, 1)$

b) Convert the Cartesian equation $x^2 + (y-2)^2 = 6$ into polar equivalent. (5)

c) Find the distance of the point $P (2, -3, 4)$ from the line $x + 2y + 2z = 13$ (5)

d) Find the point in which the given line $x=2, y=3+2t, z=-2-2t$ intersects the given plane $6x+3y-4z=-12$ (5)

Qu-6 Attempt any three of the following:

a) Define the level curves of the function of two variables and plot the level curve of $f: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ given by $f(x, y) = 4 - x^2 - y^2$ (5)

b) Use the two path test to show that $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2-y^2}{x^2+y^2}$ does not exist. (5)

c) State Sandwich theorem and evaluate $\lim_{(x,y) \rightarrow (0,0)} x \sin \frac{1}{y}$ (5)

d) Evaluate $\lim_{(x,y) \rightarrow (1,1)} \frac{x^3-y^3}{x^2+y^2}$ ii) $\lim_{(x,y) \rightarrow (0,0)} \frac{xy-2y-2x+4}{x-2}$ (5)

Qu-7 Attempt any three of the following:

a) If $f(x, y) = x^2y + y^3$ find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ (5)

b) Find the gradient vector for the function defined by $f(x, y) = x^2y + 3xy^3$ (5)

c) Find the minimum value of $x^2 + y^2 + z^2$ when $x + 2y - 4z = 5$ (5)

d) Find the Linearization $L(x, y)$ of $f(x, y) = x^2 + y^2 + 1$ at a point $(0, 0)$ (5)

Best of Luck

N.B. 1) All questions are compulsory

2) Figures to right indicate full marks. 3) Each sub question carries 4 marks.

Qu - 1 Attempt any four of the following:

(16)

- Show that $\lim_{x \rightarrow 0} \left(\frac{1}{x^k} \right)$, $k \in \mathbb{N}$ does not exist using definition.
- For $x, y \in \mathbb{R}$ prove that $|xy| = |x| |y|$
- use $\epsilon - \delta$ definition to prove that $\lim_{x \rightarrow 4} (x + 1) = 5$
- Show that the equation $x^3 - 15x + 1 = 0$ has three solutions in the interval $(-4, 4)$
- Find the asymptotes of $y = \frac{3x+5}{4x-3}$
- Find extreme value of the function $f(x) = x^4 - 18x^2 + 4$

Qu - 2 Attempt any four of the following:

(16)

- Discuss the continuity of the function $f(x)$ at $x = 0$,

$$f(x) = \begin{cases} 7x - 3 & \text{if } x \leq 0 \\ 5x + 1 & \text{if } x > 0 \end{cases}$$
- If $y = \cos(ax + b)$ then prove that $y_n = \cos(ax + b + \frac{n\pi}{2})$
- Verify LMVT for the function $f(x) = x + \frac{1}{x}$ in $[\frac{1}{2}, 3]$
- Find the Taylor's polynomial of degree n generated by $f(x) = e^x$ at $x = 0$.
- If $y = \frac{x+1}{(2x-1)(x+2)}$ find y_n .
- Find the tangent and normal to the curve $x^2 + xy - y^2 = 1$ at a point $(2, 3)$.

Qu - 3 Attempt any four of the following:

(16)

- Find the equation of the plane passing through the point $(2, 4, 5)$ and perpendicular to the line
 $x = 5 + t, y = 1 + 3t, z = 4t$.
- Write the spherical co-ordinate of cylindrical point $(3, \frac{\pi}{3}, 4)$.

[Turn over .

5

c) Define the level curves of the function of two variables and plot the level curve of

$f: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ given by $f(x, y) = 2x + 3y$

d) If $u = \log(x^2 + y^2)$ then find $\frac{\partial u}{\partial x}$, $\frac{\partial u}{\partial y}$, $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y}$ & $\frac{\partial^2 u}{\partial x^2}$

e) Find the point on the surface $z^2 = xy + 1$ which are at the least distance from the origin.

f) State Sandwich theorem and evaluate $\lim_{(x,y) \rightarrow (0,0)} \frac{x^3}{x^2+y^2}$

Qu - 4 Attempt any four of the following:

(16)

a) Find the linearization of $f(x, y) = 3x - 4y + 5$ at a point $(1, 1)$

b) If $z = \cos(x^2 + y^2)$ then find $(\frac{\partial z}{\partial x})^2 + (\frac{\partial z}{\partial y})^2$

c) Find a vector of magnitude 3, which is orthogonal to the vectors $\vec{u} = \hat{j} + 3\hat{k}$ & $\vec{v} = \hat{i} + \hat{j} + 4\hat{k}$

d) Discuss the continuity of $f(x, y, z) = 3x - y^2 + e^x$ at $(1, 1, 0)$

e) Find the distance between the skew lines $x = 1 + 7t, y = 3 + t, z = 5 - 3t$ and $x = 4 - t, y = 6, z = 7 + 2t$

f) Using the two path test check whether $\lim_{(x,y) \rightarrow (0,0)} \frac{2x^2y}{x^4+y^2}$ exist or not.

Qu - 5 Attempt any four of the following:

(16)

a) Using Polar co-ordinate evaluate $\lim_{(x,y) \rightarrow (0,0)} \frac{y^2}{x^2+y^2}$

b) If $y = x^3 e^{2x}$ find y_n .

c) State and prove Rolle's mean value theorem of differentiability.

d) Define floor function and draw its graph.

e) If $u = \sin^{-1}(\frac{x}{y})$ then show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$

f) Find the equation of a plane passing through the point $(3, -1, 2)$ and parallel to the plane $2x + y + 3z = 5$

- N.B 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
- Q.1 Attempt any FOUR of the following. 16 M
- Define divisibility in Z and prove that if a divide b and b divide c then a divide $mb + nc$ for some integers m, n .
 - Prove that there are infinite number of primes.
 - State Pascal's rule and write Pascal's triangle for $n=6$.
 - Let $f : R \setminus \{3\} \rightarrow R \setminus \{0\}$ be defined by $f(x) = \frac{1}{x-3}$ then prove that f is bijective and hence find formula for f^{-1} .
 - State and prove Rationals root theorem of polynomial.
 - State and prove fundamental theorem of algebra in $C[x]$.
- Q.2 Attempt any FOUR of the following. 16M
- Find LCM and GCD of 5104 and 254.
 - Show that $2222^{5555} + 5555^{2222}$ is divisible by 7.
 - Let $f, g, \text{ and } h$ are functions from R to R defined as
 $f(x) = 2x^3 - 7, g(x) = 3x^2, h(x) = 5x + 4$ find $[(gof)oh](1)$ and $[fo(hog)](-1)$.
 - Define equivalence class of an element. Prove that two equivalence classes are either identical or mutually disjoint.
 - Prove that number of permutation on n symbols is $n!$.
 - Prove that for any three sets A, B and $C, (A \cup B) \cap C = (A \cap C) \cup (B \cap C)$.
- Q.3 Attempt any FOUR of the following. 16M
- Write all derangement on $S = \{1, 2, 3\}$.
 - Find all cube root of unity.
 - Find all solution of $x^3 - i = 0$.
 - Find the number of positive integers between 1 to 100 which are not divisible by 3 or 5.
 - How many different letters words can be formed by using letters of word "MATHEMATICS".
 - If two roots α, β of $x^4 - 5x^3 + 11x^2 - 13x + 6 = 0$ satisfy $3\alpha + 2\beta = 7$. Find all roots.
- Q.4 Attempt any FOUR of the following. 16M
- Using De Moivre's theorem, find $(1 + i)^{10}$.
 - Prove that n th roots of unity are in G.P
 - Find the number of integer solutions to $x_1 + x_2 + x_3 = 25$.
 - Prove that $10! \equiv -1 \pmod{11}$.
 - Show that 41 divides $2^{20} - 1$.
 - State and Prove Factor theorem of divisibility in $F[x]$.
- Q.5 Attempt any FOUR of the following. 16M
- Prove that relation congruence modulo m for an integer is an equivalence relation.
 - Check whether the operation $a * b = a + b - 7$ is associative and commutative on Z .
 - Find gcd of $f(x) = x^4 - x^2 + x - 1$ and $g(x) = x^3 - x^2 + x - 1$ in $Q[x]$.
 - Find last digits of 13^{516} .
 - Let $A = \{1, 2, 3, 4\}$ and R is a relation on $A \times A$ as $(a, b) R (c, d)$ iff $a + b = c + d$. Prove that R is an equivalence relation.
 - Solve the equation $17x \equiv 9 \pmod{276}$.

- N.B 1) Q.1 is compulsory.
 2) Figures to the right indicate full marks.
 3) From Q.2 to Q.7 (a) sub question of each question is compulsory and attempt any one of (b) and (c) sub question..

Q.1 Attempt any ONE of the following.

- a) State and prove Second principle of finite induction. 10M
 b) Find the number of integers between 1 to 50 that are not divisible by 2, 3, and 7. 10M

Q.2

- a) Use mathematical induction to drive the formula. $1(1!) + 2(2!) + 3(3!) + \dots + n(n!) = (n+1)! - 1$ 8M
 b) State and prove division algorithm in \mathbb{Z} . 7M
 c) Find integers x and y satisfying $\gcd(48, 56) = 48x + 56y$. 7M

Q.3

- a) A binary operation $*$ is defined as $a * b = \frac{a^2 b^2}{4} \forall a, b \in \mathbb{Q} \setminus \{0\}$. Show that $*$ is commutative and associative. Also find identity and inverse element in $\mathbb{Q} \setminus \{0\}$ w.r.t $*$ 8M
 b) Define the term 1) Finite set 2) Infinite set 3) Cardinality of set 4) Countable set 5) uncountable set. 7M
 c) Prove that identity function of set T into itself is one- one and onto function. 7M

Q.4

- a) Prove that there are infinite number of primes of the form $4n-1$. 8M
 b) Prove that the sum $\frac{1}{p_1} + \frac{1}{p_2} + \dots + \frac{1}{p_n}$ is never an integer, where p_i is prime number. 7M
 c) A committee is to be selected from a set of 7 women and 5men. Find the number of committees if 1) the committees contains 3 women and 2 men, 2) the committee has in all 4 people with at least 2 women. 7M

Q.5

- a) Prove that $S(n, k) \equiv S(n-1, k-1) + kS(n-1, k)$. 8M
 b) Let $A = \{a, b, c\}$ $B = \{1, 2\}$ $C = \{4, 5, 6\}$ 1) list the element of $A \times B, B \times C, A \times C$ 2) Give example of relation from A to B and B to A each of which has four elements. 3) Give an example of a symmetric relation on C which has 3 element. 7M
 c) If X is a non empty set and R is an equivalence relation on X , then show that distinct equivalence classes from a partition of X 7M

Q.6

- a) State and prove multinomial theorem of integers. 8M
 b) Let σ, τ be disjoint cycles in S_n then prove that $\sigma \circ \tau = \tau \circ \sigma$. 7M
 c) State and prove Chinese Remainder theorem. 7M

Q.7

- a) Compute gcd of $x^4 + x^3 + 2x^2 + x + 1$ and $x^3 - 1$ and write in the form of $d(x) = m(x)f(x) + n(x)g(x)$. 8M
 b) Prove that a polynomial of degree n over F has at most n roots in F . 7M
 c) State and prove rational Root theorem Of polynomial and using it find the root of polynomial $f(x) = x^2 - 2$. 7M

Physics - (P-I)

Note : 1) All question are compulsory.

2) Figures to the right indicate full marks.

3) Use of scientific calculator is allowed.

Q. 1) Attempt any TWO of the following. (8)

- (a). A block slides down an incline of angle 30° with an acceleration of $0.3g$. Find the coefficient of kinetic friction.
- (b). Define the terms stress and strain.
- (c). Explain viscosity and viscous drag in fluids.
- (d). An isotropic homogeneous material prove that $Y = 2\eta(1 + \sigma)$

Q. 2) Attempt any TWO of the following. (10)

- (a). Prove that for the perfect gas $C_p - C_v = R$; where C_p and C_v are molar specific heats of a gas.
- (b). State and explain zeroth law of thermodynamics.
- (c). What are the types of optical fibre? Explain one of them.
- (d). When some quantity of an ideal gas at NTP is compressed adiabatically its volume reduces to one fourth of its original calculate final pressure and temperature. ($\gamma = 1.4$)

Q. 3) Attempt any TWO of the following. (10)

- (a). Explain the detection of ultrasonic waves using Kundt's tube.
- (b). Obtain the general solution of wave equation $\frac{\partial^2 y}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 y}{\partial t^2}$
- (c). What are the essential features of good acoustics?
- (d). Calculate the frequency of the fundamental note emitted by piezoelectric crystal.
Vibrating length = 3 mm , $Y = 8 \times 10^{10} \text{ N/m}^2$, $\rho = 2.5 \text{ gm/cc}$.

Q. 4) Attempt any TWO of the following.

(10)

- (a). Obtain an expression for the composition of the two collinear SHMs.
- (b). Obtain an expression for the linear momentum of a system of particles.
- (c). A conveyor belt is used to move material at the rate of 100 Kg/min. at a constant velocity of 2 m/s, calculate the force required and power supplied.
- (d). Obtain an expression for the composition of two mutually perpendicular SHMs, of two time periods in the ratio 1:2

Q. 5) Attempt any TWO of the following.

(10)

- (a). With the help of ray diagram prove that minimum distance between object and image is more than 4 times the focal length.
- (b). Obtain an expression of R.I. of a liquid using Newton's rings.
- (c). What do you mean by spherical aberration of a lens? Explain one method to minimize it.
- (d). Explain the properties of LASER.

**** THE END ****

(2 Hours)

Total Marks : 60

Note : 1) All question are compulsory.

2) Figures to the right indicate full marks.

3) Use of scientific calculator is allowed.

Q. 1) A) Attempt any ONE of the following. (7)

1. A object slides on a horizontal ice surface. At a certain point in its path its speed is V_0 and the object comes to rest after travelling a distance λ_0 . Show that appropriate coefficient of friction is $\frac{V_0^2}{2g\lambda_0}$.
2. Define Stress , Strain. State and explain Hooke's law. Give suitable examples.

B) Attempt any ONE of the following (3)

1. Calculate Poisson's ratio for Silver Given $Y = 7.25 \times 10^{10} \text{ N/m}^2$, $K = 11 \times 10^{10} \text{ N/m}^2$.
2. Calculate the horizontal force required to move a metal plate of area $2 \times 10^{-2} \text{ m}^2$ with the velocity $4.5 \times 10^{-2} \text{ m/s}$, when it rests on a layer of oil $1.5 \times 10^{-3} \text{ m}$ thick. Coefficient of oil is 2 PI

Q. 2) A) Attempt any ONE of the following. (7)

1. What are the interactions between a system and its surroundings? Obtain an expression for mechanical adiabatic work done by the system.
2. Derive an expression for the work done by the perfect gas in an isothermal expansion.

B) Attempt any One of the following. (3)

1. One mole of a perfect gas at 27° C is heated at constant pressure to 127° C at pressure of 10^5 N/m^2 . Find the work done by the gas the change in internal energy and the heat absorbed by the gas. Given $U = 5/2 RT$, $R = 8.4 \text{ J/molK}$.
2. The initial volume of an certain mass of an ideal gas at 1 atm pressure is 2 m^3 It expands isothermally so that its volume becomes 4 m^3 Calculate the work done by the gas.

Q. 3) A. Attempt any ONE of the following. (7)

1. Explain the acoustic diffraction method for the detection of ultrasonic waves.
2. Obtain an equation of wave motion in one dimension.

B. Attempt any ONE of the following. (3)

1. An auditorium has a volume 5000 m^3 . It is required to have reverberation time of 2.5 sec. What should be the total absorption of the hall?
2. Find the velocity of a wave in a gas. Given $\gamma = 1.4$, $R = 8.3 \text{ J/molK}$, $m = 0.03 \text{ Kg/mol}$, $T = 300 \text{ K}$

Q. 4) Attempt any One of the following. (7)

1. Obtain an expression for the composition of the two collinear SHMs of same period.
2. Obtain an expression for the total K.E. of the system of the partials.

B. Attempt any ONE of the following. (3)

1. Prove that to accelerate the 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.
2. Two mutually perpendicular SHMs acting on a particle having amplitudes 0.2m each and phase difference of $\pi/2$ rad. If the period of each is 3 sec, find the resultant motion.

Q. 5) A. Attempt any ONE of the following. (7)

1. Obtain an expression for the equivalent focal length and cardinal points for co-axial lens system.
2. Draw neat ray diagram of simple table spectrometer. Describe the function of each.

B. Attempt any ONE of the following. (3)

1. In case of interference by reflected light in thin films show that effective path difference is $\Delta = 2\mu t \cos r \pm \frac{\lambda}{2}$.
2. Fringes of same thickness are seen in a thin glass wedge of R. I. = 1.65. If the fringe spacing is 2mm and wavelength is 6600 \AA what is angle of wedge in seconds of arc?

Q. 6) A Attempt any ONE of the following. (7)

1. Explain the principle of working of LASER.
2. What is the numerical aperture of an optical fibre? Derive the necessary expression.

B. Attempt Any ONE of the following. (3)

1. Give uses of optical fibre.
2. Give uses of LASER.

**** THE END ****

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

physics - (Paper - II)

June
2019

Con. : 291-19.

(OLD COURSE)

OR-7008

(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) Derive an expression for growth of a current in series L-R circuit connected to a d.c. source.
(ii) Explain the series L-C-R resonance circuit. Draw a neat phasor diagram.
(b) Attempt any **one** of the following :— 3
(i) A sine wave has a peak value of 170V. What is its value at (a) 30 (b) 90.
(ii) Find the capacitive reactance of $20\mu\text{F}$ capacitor for an A.C. signal of 50Hz.
2. (a) Attempt any **one** of the following :— 7
(i) State and explain the correspondence principle with example.
(ii) With the help of a neat labeled diagram explain Bragg's law.
(b) Attempt any **one** of the following :— 3
(i) In state $n = 3$, obtain the velocity, K.E and P.E. of electron in Hydrogen atom.
(ii) The accelerating voltage of an X-ray tube is 60KV, Find the minimum wavelength of X-rays.
{ Data given for both problems : $h = 6.63 \times 10^{-34}$ J-S, $m = 9.1 \times 10^{-31}$ Kg,
 $C = 3 \times 10^8$ m/s. $\epsilon_0 = 8.85 \times 10^{-12}$ S.I., $e = 1.6 \times 10^{-19}$ C }
3. (a) Attempt any **one** of the following :— 7
(i) What is filter circuit? Explain capacitor filter with the help of half-wave rectifier.
(ii) Write a note on transistor as an amplifier in CE-mode.
(b) Attempt any **one** of the following :— 3
(i) Draw symbol, write truth-table of NAND- gate.
(ii) Draw block diagram, logic diagram of Half Adder.

[TURN OVER

(13)

4. (a) Attempt any one of the following :— 7
- (i) Explain construction, working of De-Sauty's capacitance bridge.
 - (ii) Show that current is proportional to the deflection θ for *M.C.G.*
- (b) Attempt any one of the following :— 3
- (i) For Wien Bridge circuit $C_1=C_2=0.01\mu F$, $R_3=R_4=10K$, Find the frequency of the bridge.
 - (ii) Define (a) Voltage sensitivity (b) Charge sensitivity.
5. (a) Attempt any one of the following :— 7
- (i) State the law of radioactive decay. Derive necessary equation. Plot suitable graph.
 - (ii) Write a short note on Nuclear Magnetic Resonance.
- (b) Attempt any one of the following :— 3
- (i) Explain the following terms : 1. Mass Number 2. Isotopes.
 - (ii) Explain the following terms : 1. Atomic Mass 2. Atomic Number.
6. (a) Attempt any one of the following :— 7
- (i) What is gravitational red-shift ? Show that photon has lesser frequency on the earth.
 - (ii) Derive an expression for the change in the wavelength in Compton effect.
- (b) Attempt any one of the following :— 3
- (i) Obtain the wavelength associated with an electron subjected to a potential difference of 1.25 KV. (Use the data given in Q.2 b.)
 - (ii) A non-relativistic electron has wavelength 2.0 A, What is it's energy ? (Use the required data of Q2.b)
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Con. : 291-19.**(REVISED COURSE)****OR-7008**

(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. Answer any **two** of the following :—

8

- In a simple series L-R (D.C.) circuit derive an expression for the growth of current. Hence define time constant of the circuit.
- Explain the resonance in series and parallel L-C-R circuit.
- A fully charged capacitor by source of emf how discharges through a resistor R. Show that decay is exponential.
- Peak-to-peak value of a sine wave is 350V. Find the average and rms value of the value.

2. Answer any **two** of the following :—

10

- State and explain law of radioactive decay.
- With the help of a neat diagram explain Rutherford's nuclear atom model.
- Write a note on Nuclear magnetic resonance.
- Find the diameter of Fe^{56} nucleus. Given $R_0 = 1.2 \times 10^{-15}$ m.

3. Answer any **two** of the following :—

10

- What are filter circuits ? Explain capacitor filter with the help of half wave rectifier.
- Write a note on transmitter as an amplifier.
- Explain construction and working of Half adder.
- Draw symbols, write truth tables for (i) NOR gate (ii) NOT gate.

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4. Answer any **two** of the following :—

10

- (a) State and explain maximum power transfer theorem.
- (b) Discuss the general condition to balance A.C. bridge.
- (c) Define (i) Voltage sensitivity (ii) Current sensitivity.
- (d) In a De-Sauty's bridge determine the capacitor if $R_2 = 2K$, $R_1 = 1.5 K$ and $c_2 = 0.33 \mu F$.

5. Answer any **two** of the following :—

10

- (a) With the help of a diagram explain in brief Bragg's X-ray diffractometer.
- (b) What is gravitational Red Shift ?
- (c) Distinguish between continuous and characteristics x-ray spectrum.
- (d) If a energy of neutron in rest state is 8.58 eV What will be its associated de-Broglie wavelength ? [$m_0 = 1.6 \times 10^{-27} \text{ Kg}$].

Instructions:

1. All questions are compulsory.
2. Attempt any TWO sub-questions from each question.
3. Each sub-question is of 4 marks.

- Q.1** Answer any TWO of the following: [8M]
- (a) Draw and explain the block diagram of computer.
 - (b) Carry out the following conversions
 - i) $(105)_{10} \dots\dots (?)_2$
 - ii) $(204)_{10} \dots\dots (?)_8$
 - iii) $(1101)_2 \dots\dots\dots (?)_{10}$
 - (c) Perform the following binary subtraction using 1's and 2's complement method
 - i) $111011 - 100011$
 - ii) $(17)_2 - (19)_2$
 - (d) Explain excess 3 codes with example.
Convert $(DB)_{16}$ into equivalent decimal no.
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- Q.2** Answer any TWO of the following: [8M]
- (a) Draw and explain basic logic gates.
 - (b) Draw and explain concept of clocked S-R flip flop.
 - (c) Define multiplexer. Draw and explain 4:1 mux
 - (d) Explain Encoder in detail.
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- Q.3** Answer any TWO of the following: [8M]
- (a) Explain the following
 - i) ROM
 - ii) PROM
 - iii) UVPRM
 - (b) Explain magnetic disk with suitable diagram.
 - (c) Draw and explain cache memory.
 - (d) Draw block diagram of CPU and explain its functions.
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- Q.4** Answer any TWO of the following: [8M]
- (a) Explain DRAM and SRAM in detail.
 - (b) Write a note on DMA.
 - (c) Explain optical memory in detail.
 - (d) Define I/O module .explain programmed I/O module
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- Q.5** Answer any TWO of the following: [8M]
- (a) What is operating system? Discuss functions of operating system.
 - (b) Explain uni programming and multi programming system
 - (c) Explain multiport memory.
 - (d) Write a note on Time sharing.
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- Q.6** Answer any TWO of the following: [8M]
- (a) Explain general purpose and segment register of 8086 microprocessor.
 - (b) Draw neat and labeled block diagram of 8086 microprocessor.
 - (c) Explain features of 8085.
 - (d) Write and 8085 program to subtract two 8 bit numbers.

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Instructions:

1. All questions are compulsory.
2. Attempt any TWO sub-questions from each question.
3. Each sub-question is of 5 marks.

Q.1		Answer any TWO of the following:	[2X5=10]
	(a)	Draw and explain the block diagram of computer.	
	(b)	Carry out the following conversions i) $(101011)_2 \dots\dots (?)_{10}$ ii) $(7B.2C)_{16} \dots\dots (?)_{10}$ iii) $(23)_8 \dots\dots (?)_2$	
	(c)	Perform the following binary subtraction using 1's and 2's complement method i) $101011 - 10100$ ii) $1011011 - 1001001$	
Q.2		Answer any TWO of the following:	[2X5=10]
	(a)	Draw full adder circuit and explain with examples	
	(b)	Define FF. 0045plain J-K FF.	
	(c)	Draw NAND and NOR gates. Explain realization of basic gates using NAND and NOR gates.	
Q.3		Answer any TWO of the following:	[2X5=10]
	(a)	What is RAM? Explain SRAM and DRAM.	
	(b)	Define Input devices and output devices in detail. Explain any one output device in detail.	
	(c)	Explain Instruction cycle and Instruction pipelining.	
Q.4		Answer any TWO of the following:	[2X5=10]
	(a)	Draw and explain RAID memory.	
	(b)	Explain Interrupt Driven I/O module.	
	(c)	State and Explain different types of ROM.	
Q.5		Answer any TWO of the following:	[2X5=10]
	(a)	What is operating system? Explain its features.	
	(b)	Discuss characteristics of multiprocessor.	
	(c)	Write a note on scheduling.	
Q.6		Answer any TWO of the following:	[2X5=10]
	(a)	Draw neat and labeled block diagram of 8086 microprocessor.	
	(b)	Explain features of 8085.	
	(c)	Write and 8085 program to subtract two 8 bit numbers.	

Instructions:

1. All questions are compulsory.
2. Attempt any TWO sub-questions from each question.
3. Each sub-question is of 4 marks.

Q.1 Answer any TWO of the following: [8M]

- (a) Write a program in c to generate prime numbers.
- (b) What is an algorithm? Explain notions of an algorithm.
- (c) Explain event driven and object oriented approach.
- (d) How to calculate the run time of an algorithm.

Q.2 Answer any TWO of the following: [8M]

- (a) Explain following functions
 - i) getch()
 - ii) get()
 - iii) putchar()
 - iv) putc()
 - v) printf()
- (b) Explain the arithmetic and logical operator in C.
- (c) Write a program in c to check whether the number is odd or even.
- (d) Write a program in c generate Fibonacci series.

Q.3 Answer any TWO of the following: [8M]

- (a) What is Array? Explain One dimensional and multi dimensional array.
- (b) Write a program for addition of two numbers using structure.
- (c) Explain string variables, characters and string handling functions.
- (d) Discuss Union with examples.

Q.4 Answer any TWO of the following: [8M]

- (a) What is Recursion? Explain with example.
- (b) Explain Bubble sort algorithm.
- (c) What do u mean by call by value in c. Explain with one suitable example.
- (d) Write a note on Algorithm efficiency.

Q.5 Answer any TWO of the following: [8M]

- (a) What is pointer? Explain referencing and dereferencing of pointers.
- (b) Explain following functions.
Malloc(), calloc(), realloc(), free()
- (c) Explain following functions
fputs(), fclose(), fread(), fwrite()
- (d) Write a program to delete a specific line from text file.

Q.6 Answer any TWO of the following: [8M]

- (a) Write an algorithm to add or delete an element from stack
- (b) Write an algorithm to insert a node in the beginning of a linked list.
- (c) Define Queue write an algorithm to insert and delete an element from queue
- (d) Explain the concept of FIFO, Overflow and Underflow with respect to queues.

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Instructions:

1. All questions are compulsory.
2. Attempt any TWO sub-questions from each question.
3. Each sub-question is of 4 marks.

- Q.1 Answer any TWO of the following: [10M]
- (a) Define variables and constants in C. Explain Data types in c
 - (b) Write a program in c to find the GCD of two positive integers.
 - (c) Explain best , worst and average case complexity of an algorithm..
- Q.2 Answer any TWO of the following: [10M]
- (a) Explain following functions
 - i) scanf()
 - ii) get()
 - iii) putchar()
 - iv) putc()
 - v) printf()
 - (b) Explain the arithmetic and logical operator in C.
 - (c) Write a program in c to calculate factorial of a given number..
- Q.3 Answer any TWO of the following: [10M]
- (a) What is Array? Explain One dimensional and multi dimensional array.
 - (b) Write a program for addition of two numbers using structure.
 - (c) Write a program to create a structure of "student_record" to contain Name, date of birth and total marks obtained.
- Q.4 Answer any TWO of the following: [10M]
- (a) Write a program to find the factorial of a number using recursion.
 - (b) Explain Merge sort algorithm.
 - (c) Write a note on Macros in C.
- Q.5 Answer any TWO of the following: [10M]
- (a) What is pointer? Explain referencing and dereferencing of pointers.
 - (b) Explain following functions.
Malloc(), calloc(), realloc(), free()
 - (c) Write a program to convert the content of file to uppercase.
- Q.6 Answer any TWO of the following: [10M]
- (a) Explain insertion and deletion of a node from linked list.
 - (b) What is Stack? Write an algorithm to add or delete an element from stack
 - (c) Define Queue write an algorithm to insert and delete an element from queue

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

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