

F.Y.B.Sc (Computer Science)

Foundation Course
P-I

April
2015

Con: 213-15.

CP-2045

Duration: 3Hrs.

Total Marks: 100

N.B. (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

Q.1. "India is a multi-religious and multi-cultural nation." Discuss.

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OR

Write a note on each of the following:

- (a) Caste system in India
- (b) Types of violence against women in India
- (c) Types of mental retardation

Q.2. What are the characteristic features of Indian Constitution? Describe with illustrations.

OR

Write a short note on each of the following:

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- (a) Regionalism in India
- (b) Woman's role in Indian politics
- (c) Give any five fundamental duties of Indian citizen

Q.3. What are the causes of the problems of elderly persons? Give suitable measure to prevent them.

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OR

Write a note on each of the following:

- (a) Child labour in India
- (b) Causes and measures to prevent AIDS

Q.4. What is globalization? Explain its impacts on employment opportunities.

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OR

Write a note on each of the following:

- (a) Four premises of political democracy
- (b) Philosophy of Human Rights
- (c) Right to Liberty

Q.5. Discuss structure and functions of eco-system.

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OR

Write a note on each of the following:

- (a) Sustainable development
- (b) Causes of environmental devastation
- (c) Agents of socialization

Q.6. Critically examine Maslow's Theory of Self Actualization.

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OR

Write a note on each of the following:

- (a) Impact of urbanization on society
- (b) Role of nature and nurture in the individual development
- (c) Causes of farmers' suicide in India

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) In Question Nos. 2 to 7, part 'a' is **compulsory** and solve any **two** from remaining parts.
 (3) **Figures** to the **right** indicate **full** marks.

1. (a) Find a vector perpendicular to the plane containing the points A(-1, -1, 0), B(2, 2, -1) and C(-3, 1, 2). 5
- (b) Give example of a function which is continuous on IR except at one point with justification. 5
2. (a) Define and draw graph of :- 7
 - (i) Polynomial function
 - (ii) Ceiling function.
- (b) Using ϵ - δ definition of limit, prove that 4

$$\lim_{x \rightarrow 3} x^2 + 1 = 0$$
- (c) Show that polynomial of degree n is continuous on IR. 4
- (d) Discuss continuity of following function at $x = 2$. 4

$$f(x) = x - 4 \quad \text{if } x \leq 2$$

$$= x + 4 \quad \text{if } x > 2.$$
3. (a) Show that differentiable functions are continuous. Is the converse true? Justify. 7
- (b) Discuss differentiability of $f(x) = \sin |x| \quad \forall x \in \text{IR}$. 4
- (c) Find the equation of tangent and normal to the curve $2x^2 + xy + y^2 = 28$ at point (2, 3). 4
- (d) Calculate the n^{th} order derivative of $\sin^2 x \cos^2 x$. 4
4. (a) State and prove Lagrange's mean value theorem. 7
- (b) Verify Rolle's mean value theorem for $f(x) = \sin^2 x ; 0 \leq x \leq \pi$. 4
- (c) Find Taylor's polynomial of degree n generated by $f(x) = \cos x$ at $x = 0$. 4
- (d) Find local maximum and minimum of the function $f(x) = x^4 - 18x^2 + 4$. 4
5. (a) Write parametric equations of a line 7
 - (i) through P(2, 1, 2) and perpendicular to the vectors $u = i + 2j - k$ and $v = 3i + 4j + k$.
 - (ii) through Q (2, 1, -1) and parallel to x - axis.
- (b) Explain relation between polar coordinates and Cartesian coordinates giving one example. 4
- (c) Find the point in which the line $x = -1, y = 3t$ and $z = 1 + 3t$ intersects the plane having equation $2x - y + 3z = 6$. 4
- (d) Show that angle between any two diagonals of a cube is $\cos^{-1}(1/3)$. 4

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6. (a) State Sandwich theorem, find

7

$$\lim_{(x,y) \rightarrow (0,0)} \frac{4 - \cos \sqrt{|xy|}}{|xy|} \text{ if } 2|xy| - \frac{x^2 y^2}{6} < 4 - 4 \cos \sqrt{|xy|} < 2|xy|.$$

(b) Use two Path test to show that

4

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2}{x^2 + y^2} \text{ does not exist.}$$

(c) Convert into polar coordinates and find

4

$$\lim_{(x,y) \rightarrow (0,0)} \cos \left[\frac{x^3 - y^3}{x^2 - y^2} \right]$$

(d) Show that $\lim_{(x,y) \rightarrow (0,0)} f(x,y)$ does not exist if $f(x, y) = \left[\frac{2x^2y}{x^4 + y^2} \right]$.

4

7. (a) State second derivative test. Verify $f_{yx} = f_{xy}$ for $f(x, y) = x \sin y + y \sin x + xy$.

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(b) If $u = \log(x^2 + y^2)$ then show that -

4

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0.$$

(c) Using Lagrange's Multiplier, find minimum value of $x^2 + y^2 + z^2$ when $x + 2y - 4z = 5$.

4

(d) Find the linearization of $f(x, y) = x^2 - xy + \frac{y^2}{2} + 3$ at a point $(3, 2)$.

4

Con. 215-15.

CP-2392

(3 Hours)

[Total Marks : 100

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)&(d)

Q.1>Attempt any one:

(a) State and prove Principle of Inclusion and Exclusion. (10)

(b) Prove that R is any Equivalence relation on set S iff R induces partition of S. (10)

Q.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 154 and 231. (4)

(d) Prove that if a/b then $3^a-1/3^b-1$. (4)

Q.3>(a) Define Bijective map & Prove that Inverse of Bijective map is also Bijective. (7)

(b) Show that the mapping $f(x)=7x-5$ from Real numbers to itself is Bijective & find its inverse. (4)(c) Check whether the Operation $a*b=a+b-ab$ is Associative & Commutative on \mathbb{Z} . (4)(d) Prove that for any three sets A, B & C, $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$. (4)Q.4>(a) If a, b, c, d are integers & n is fixed positive integer then if $a \equiv b \pmod{n}$ & $b \equiv c \pmod{n}$ then $a \equiv c \pmod{n}$ (7)(b) Prove that $10! \equiv -1 \pmod{11}$ (4)(c) Solve the Equation $17x \equiv 9 \pmod{276}$ (4)(d) find the remainder when 2^{20} is divided by 41. (4)

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APR 2012

F.Y. B.Sc. (Computer Science)
Mathematical (Paper II)

- Q.5>(a) In Z , R defined by xRy iff $x-y$ is divisible by 4. Prove that R is an equivalence relation and find the Corresponding Equivalence Classes. (7)
- (b) How many different letters words can be formed by using the letters of "MISSISSIPPI". (4)
- (c) In how ways can 12 different books be distributed among four children so that (4)
- (i) each child gets 3 books
- (ii) the two oldest children get four books each while two youngest get two books each
- (d) Write all permutation of $S=\{a,b,c\}$. (4)
- Q.6>(a) find the number of positive integers between 1 to 300 which are not divisible by 2,3 or 5. (7)
- (b) find the total number of integer solutions to $x_1+x_2+\dots+x_6=20$. (4)
- (c) Define irreflexive, Antisymmetric and equivalence relation. (4)
- (d) Compute $S(4,2)$. (4)
- Q.7>(a) State and Prove Rational Roots theorem. (7)
- (b) Using De Moivre's Theorem to find $(1+i)^6$ (4)
- (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 cube roots of -1 . (4)

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4 5

Note : 1) All questions are compulsory and carry equal marks.

2) Figures to the right indicate full marks.

3) Use of non programmable scientific calculator is allowed.

PHYSICS --I

CONSTANTS: $1 \text{ atm} = 10^5 \text{ N/m}^2$, $R = 8.4 \text{ J/mol K}$

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

- 1) State Bernoulli's theorem. Derive necessary equation.
- 2) Explain the following;
 - a) Young's modulus
 - b) Modulus of rigidity
 - c) Bulk modulus
 - d) Poisson's ratio.

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

- 1) A mass M kept on a smooth plane inclined surface at an angle θ to the horizontal. Find components of force to maintain mass in equilibrium with the help of the diagram.
- 2) Find horizontal force required to move a metal plate of area 0.02 m^2 with the velocity 0.045 m/s when it is rest on a layer of oil of 1 mm thickness, given coefficient of viscosity of oil $= 2 \text{ SI unit}$.

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

- 1) Derive an expression for the mechanical work-done in adiabatic process.
- 2) Define enthalpy, discuss free expansion of gas and hence state Joule's law.

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

- 1) State and explain Zeroth law of thermodynamics.
- 2) Find the work done by the gas if initial volume of certain mass of an ideal gas at 1 atmospheric pressure is 3 m^3 . It expands isothermally and its volume becomes 5 m^3 .

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

- 1) What is reverberation. Define coefficient of absorption. Derive necessary formula to measure it.
- 2) With the help of neat diagram explain acoustic diffraction method.

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

- 1) A wave on a string is describe by $Y = 0.2 \sin (10t + 2x)$. Find its amplitude, frequency and wavelength.
- 2) An auditorium has a volume of 3000 m^3 It is required to have reverberation time of 1.5 sec . what should be the total absorption in the hall?

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Q. 4 A) Attempt any one of the following. (7)

- 1) Discuss the composition of two collinear SHMs of same period, hence obtain an expression for its amplitude R.
- 2) Show that in case of conveyor belt the conservation theorem of mechanical energy does not apply.

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

- 1) Two particle of masses 2 Kg and 3 Kg have positions given by vectors $2\mathbf{i} - 2\mathbf{j} + 5\mathbf{k}$ and $4\mathbf{i} + \mathbf{j} - 5\mathbf{k}$ respectively. Find instantaneous positions of centre of mass of the system.
- 2) Draw Lissajous figures, for two mutually perpendicular SHMs having same period for $\delta = 0$, $\delta = 180$.

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

- 1) Show that radius of Newton's dark ring is directly proportional square root of natural number.
- 2) Two thin lenses L_1 and L_2 of focal lengths f_1 and f_2 are separated by finite distance d , find expression for the equivalent focal length.

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

- 1) Draw a neat ray diagram of spherical aberration.
- 2) Draw a neat labeled diagram to show angle of minimum deviation using spectrometer..

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

- 1) Explain construction and working of He-Ne LASER.
- 2) Explain propagation of light through graded index optical fibre.

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

- 1) Explain the following terms of LASER ; a) Coherence b) Directionality.
- 2) State any two advantages of optical fibre and one use in medicine.

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Con. 217-15.

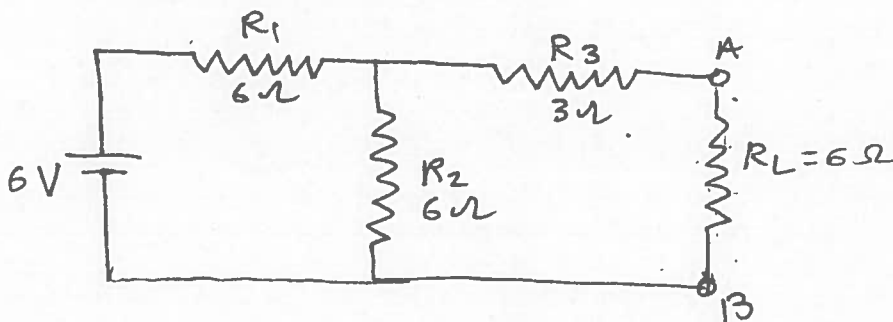
CP-2432

(2 Hours)

[Total Marks : 60

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

1. (a) Attempt any **one** of the following :- 7
 (i) What is time constant of an L-R series circuit. Derive an expression for it by considering decay of current in an L-R circuit.
 (ii) Show that in an a.c. circuit with pure resistance, the current and voltage are always in phase.
- (b) In a series LCR circuit, $L = 400 \mu\text{H}$, $R = 10\Omega$ and $C = 25 \mu\text{F}$. Find the resonant frequency and Q factor at resonance. 3
2. (a) Attempt any **one** of the following :- 7
 (i) Explain the diffraction of X-rays and derive the Bragg's law for the same.
 (ii) With the help of an appropriate diagram, explain origin of spectral lines in H-atom.
- (b) Find the frequency of revolution of an electron in H-atom in $n = 2$ state. How many rotations will it make in 10^{-8} secs ? 3
3. (a) Attempt any **one** of the following :- 7
 (i) Explain the input and output characteristics of CE configuration of transistor. Write your inference from these characteristics.
 (ii) Explain Half adder and full adder with Logic circuit diagram using Logic Gates. Write the truth tables.
- (b) State and prove De'Morgan's first theorem. 3
4. (a) Attempt any **one** of the following :- 7
 (i) Obtain the condition of balance for Maxwell's induction bridge. What are its limitations ?
 (ii) State and explain reciprocity theorem.
- (b) Determine the Thevenin equivalent of the circuit given below. Hence find load voltage and load-current. 3



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5. (a) Attempt any **one** of the following :-

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(i) Explain de-Broglie hypothesis of matter waves.

(ii) What is Compton Effect ? Derive an expression for the change in wavelength.

3

(b) Calculate the frequency of the X-ray of momentum 1.4×10^{-23} kg. m/s.

7

6. (a) Attempt any **one** of the following :-

(i) Write notes on NMR and Radio-metric dating. (Nuclear magnetic Resonance).

(ii) Explain the construction and working of a moving coil galvanometer.

3

(b) Define atomic number, atomic mass number. With the help of mass-energy relation obtain $1 \text{ amu} = 931 \text{ Mev}$.



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[Total Marks: 60]

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

(2) Figures to the right indicate full marks.

(3) Answers to both the sections to be written in same answer book.

SECTION-I

Q1 Attempt any two :

- a) Explain with a diagram the layers and views of a computer system. 05
- b) Convert the following: 05
- (i) $(378568)_{10} = ()_2$ (ii) $(32AF 2B)_{16} = ()_{10}$
- c) Perform the following binary subtraction using 1's and 2's complement seperately: 05
- (i) $(11011-00111)$ (ii) $(111101-001011)$

Q2 Attempt any two:

- a) Draw the logic diagram and truth table for: 05
- (i) EX-OR Gate (ii) NAND Gate
- b) Explain J-K master slave flip flop. 05
- c) Explain Multiplexer with the circuit diagram and truth table. 05

Q3 Attempt any two :

- a) Explain asynchronous data transfer. 05
- b) Explain different types of ROMs with its purposes. 05
- c) Write a short note on cache memory. 05

SECTION-II

Q4 Attempt any two :

- a) Explain magnetic tape with neat and labeled diagram. 05
- b) Write a short note on Direct Mapping. 05
- c) Explain the reasons why we need I/O module. 05

Q5 Attempt any two :

- a) Write a short note on Paging Technique. 05
- b) What are the services provided by an Operating System? 05
- c) Explain multiprocessing. What is Time Shared Bus? 05

Q6 Attempt any two :

- a) Explain with the help of a diagram various programmable registers of 8085. 05
- b) Draw neat diagram of 8086 microprocessor. 05
- c) Write an 8085 program to add two 8-bit numbers. 05

Note:

1. All questions are compulsory.
2. Figures to the right indicate marks.
3. Mixing of sub-questions is not allowed.
4. Answers to both the sections have to be written in same answer-book.

Section - I

Q1. Attempt any two:

- a) What are different control structure statements? 5
- b) List and explain three approaches in programming. Explain any one in detail. 5
- c) What is an algorithm? State an algorithm to state whether a number is prime or not. 5

Q2. Attempt any two:

- a) Explain with an example while and do...while loops in C. 5
- b) State and explain the meaning of relational operators supported by C. 5
- c) Write a program in C to find out odd numbers from 1 to 50. 5

Q3. Attempt any two:

- a) Explain any two storage classes of C. 5
- b) What is an array? Explain one and two dimensional array with an example. 5
- c) Explain Bubble sort algorithm. 5

Section - II

Q4. Attempt any two:

- a) What is recursion? Write a program in C to calculate the factorial of a number using recursion. 5
- b) Write a note on Algorithmic efficiency. 5
- c) What is a function in C? State the advantages of using a function. 5

Q5. Attempt any two:

- a) What is a pointer in C? State the advantages of a pointer. 5
- b) Explain the file Opening and Closing process with functions in C. 5
- c) Define and explain the working of Union. 5

Q6. Attempt any two:

- a) Define Stack and its features. Write a program in C to implement Stack. 5
- b) Explain the terms "Overflow" and "Underflow" with respect to a Linked List. 5
- c) Write an algorithm to insert an element to a queue. 5