F.Y.B.Sc. (Computer Sci.) Feb 2017

VT-Exam. Paper (IDOL)-Jan.-17-1 Foundation Course - I

Con. 107-17.   MI-4212

(3 Hours)   [Total Marks : 100

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

1. Discuss the multi lingual and multi religious nature of Indian society.   15
   Or
   Write a note on **each** of the following :
   (a) Causes of declining sex ratio
   (b) Causes of visual disability
   (c) Positive role of media.

2. Discuss the features of the Indian Constitution.   15
   Or
   Write a note on **each** of the following :
   (a) Features of party system in India
   (b) Municipal Corporation
   (c) Role of women in politics.

3. Discuss the problems of elderly in India and also suggest measures to solve their problems.   20
   Or
   Write a note on **each** of the following :
   (a) Causes and measures related to the problems of child labour.
   (b) Causes and effects of trafficking of women in India.

4. Discuss in detail the concepts of Liberalization, Privatization and Globalization.   15
   Or
   Write a note on **each** of the following :
   (a) Concept of Human rights
   (b) Development of Human rights
   (c) The Universal Declaration of Human rights.

5. Discuss the causes and effects of environmental degradation.   15
   Or
   Write a note on **each** of the following :
   (a) Agents of socialization
   (b) Causes of Stress
   (c) Concept of Eco system.

6. Explain in detail the conflict management mechanisms.   20
   Or
   Write a note on **each** of the following :
   (a) Impact of urbanization on health and sanitation
   (b) Changing lifestyle and impact on culture
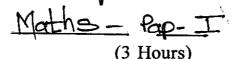   (c) Impact of changing values and lifestyles.

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F.Y.B.Sc. (Computer Sci.)

Maths – Pap - I

Con. 112–17.

MI–4015

(3 Hours) [Total Marks : 100]

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

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

1. Solve the following :– 10

   (a) State Sandwich theorem of limits and hence evaluate $\lim_{x \to 0} \dfrac{1 - \cos x}{x^2}$.

   (b) Define continuity of the function of two variables. Examine the continuity of f(x, y) at (1, 2)

   $$f(x, y) = \begin{cases} \dfrac{x^2 - 4y^2}{x - 2y} & \text{if } x \neq 2y \\ 3 & \text{otherwise.} \end{cases}$$

2. Attempt any **three** :– 15

   (a) Draw graph of flooring function by defining it.

   (b) Show that $\lim_{x \to 0} \dfrac{1}{x^4}$ does not exit.

   (c) Show that $\lim_{x \to 2} f(x)$ does not exist at x = 2.

   $$f(x) = \begin{cases} 3 - x & \text{if } x \leq 2 \\ \dfrac{x}{2} + 1 & \text{if } x > 2 \cdot \end{cases}$$

   (d) Discuss continuity of function f(x) on IR where $f(x) = x^3 + x^2 - 2x + 1$.

3. Attempt any **three** :– 15

   (a) Show that if f : I → IR, where I is open interval in IR, is differentiable at point p in IR then f is continuous. Is converse true ? Justify.

   (b) Check the differentiability of f(x) at x = 4.

   $$f(x) = \begin{cases} x + 8 & \text{if } x \geq 4 \\ 3x + 2 & \text{if } x < 4. \end{cases}$$

   (c) If $y = \tan^{-1} x$ then prove that $(1 + x^2) y_2 + 2xy_1 = 0$.

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

②

[TURN OVER

4. Attempt any **three** :— 15

    (a) State and prove Lagrange's mean value theorem of differentiability.

    (b) Verify Rolle's mean value theorem for $f(x) = \dfrac{\sin x}{e^x}$ in the interval $[0, \pi]$.

    (c) Find the critical points of the function $f(x) = x^4 - 18x^2 + 4$.

    (d) Find Taylor's polynomial of degree n generated by function
        $f(x) = \cos x$ at $x = 0$

5. Attempt any **three** :— 15

    (a) Define polar coordinates. Further, give relation between Cartesian coordinates, polar coordinates and spherical coordinates.

    (b) Find angle between any two diagonals of a cube.

    (c) Find area of triangle with vertices P(6, 2, 3), Q(3, 3, –2) and R(2, –1, –2).

    (d) Find distance between line $x = 2 + t$, $y = 1 + t$, $z = -\dfrac{1}{2} - \dfrac{1}{2x}$ and
        plane $x + 2y + 6z = 10$.

6. Solve any **three** :— 15

    (a) Show that $f_x(x, 0) = f_y(0, y)$, for the function ,

$$f(x, y) = \begin{cases} \dfrac{xy(x^2 - y^2)}{x^2 + y^2} & \text{if } x^2 + y^2 \neq 0 \\ 0 & \text{otherwise.} \end{cases}$$

    (b) Using polar coordinates, show that $\lim_{(x,y)\to(0,0)} \dfrac{x^3}{x^2 + y^2}$.

    (c) Check if the limit exists. $\lim_{(x,y)\to(1,1)} \dfrac{(x + y)(x^3 + y^2 - 4x)}{(x + 2y)}$

    (d) Show that the limit do not exist using two path test. $\lim_{(x,y)\to(0,0)} \dfrac{2x^2 y}{x^4 + y^2}$

7. Solve any **three** :— 15

    (a) If $z = \cos(x^2 y^2)$ then find $\left(\dfrac{\partial z}{\partial x}\right)^2 + \left(\dfrac{\partial z}{\partial y}\right)^2$.

    (b) Find $\dfrac{\partial f}{\partial x}$ if $f(x, y) = \dfrac{x^2 y}{\sqrt{x^2 + y^2}}$.

    (c) Find ∇f at the point (1, 2) for $f(x, y) = y \log x + xy^2$.

    (d) Find the linearization of $f(x, y) = x^2 - yx + y^2/2 + 3$ at (3, 2).

Con. 113-17.

F.Y.B.Sci.(Compter Sci.)

Maths - Pap—II

Mar 2017 MI-4329

(3 Hours)   [Total Marks : 100

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

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

(3) From Question No. **2** to **7**, subquestion **(a)** is **compulsory** and attempt any **two** from **(b) (c)** and **(d)**.

1. Attempt any **one** :—
   (a) State and prove Principle of Exclusion and Inclusion for sets.   10
   (b) Prove that if R is any Equivalence relation on set S then R induces partition of S. 10

2. (a) State and Prove Euclid's lemma.   7
   (b) If a and b are two integers such that $(a, b) = 1$ prove that –   4
       (i) $(a + b, a - b) = 1$ or 2
       (ii) $(a^2, b^2) = 1$
   (c) Find lcm and gcd of 1430 and 1222.   4
   (d) Prove that if a/b then $3^a - 1/3^b - 1$.   4

3. (a) Prove that an Injective mapping from finite set to itself is Bijective.   7
   (b) Show that the mapping $f(x) = 3x + 7$ from Real numbers to itself is Bijective and find 4
       its inverse.
   (c) If f and g are two functions on Real numbers. Is fog=gof ? Justify.   4
   (d) Prove that for any three sets A, B and C, $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$. 4

4. (a) State and Prove "Fermat's little Theorem".   7
   (b) Solve the equation $17x \equiv 9 \pmod{276}$ 4
   (c) If a, b, c, d are integers and n is fixed positive integer then if $a \equiv b \pmod n$ and $c \equiv d$ 4
       $\pmod n$ then $a + c \equiv b + d \pmod n$
   (d) Find the remainder when 2^{20} is divided by 41.   4

5. (a) State and Prove Recurrence formula for sterling number of second kind.   7
   (b) In Z, R is defined by xRy iff x-y is divisible by 4. Prove that R is an equivalence 4
       relation.
   (c) In how ways can 10 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 derangements of the set {1, 2, 3}.   4

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[TURN OVER

6. (a) Find the number of positive integers between 1 to 100 which are not divisible by 2, 5   **7**
         or 7.
    (b) Compute S(4, 3).   **4**
    (c) If R is reflexive relation such that whenever aRb and bRc then aRc prove that R is an   **4**
         equivalence relation.
    (d) Find the total number of integer solutions to $x_1 + x_2 + \cdots \cdots + x_6 = 15$.   **4**

7. (a) State and Prove Rational Roots theorem.   **7**
    (b) If Z_1 and Z_2 are two complex numbers then prove that Arg $(Z_1 Z_2) =$ Arg $Z_1 +$ Arg Z_2. **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**

VT-Exam. Paper (IDOL)-Jan.-17-2

F.Y.B.Sc. (Computer Sci.)

Con. 108-17.

Physics - Pap-I

Mar 2017

MI-4403

(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** calculator is **allowed**.

1.　(a)　Attempt any **one** of the following :　　　　　　　　　　　　　　7
　　　　(i)　Explain with the necessary diagram --
　　　　　　(1)　Young's modulus　　　　　(2)　Bulk modulus
　　　　　　(3)　Modulus of rigidity and　　(4)　Poisson's ratio.
　　　　(ii)　Define Viscosity State its SI units, dimensions. Derive the equation of continuity.
　　(b)　Attempt any **one** of the following :　　　　　　　　　　　　　　3
　　　　(i)　A mass M is kept on a smooth plane inclined at an angle θ to the horizontal. Find the magnitude of force F parallel to the inclined plane which shluld be applied to the mass in order to keep it in equilibuium.
　　　　(ii)　A metal wire of length 'L' and radius r is stretched. Assuming that volume of the wire is unchanged, show that Poisson's ratio of the material is ½.

2.　(a)　Attempt any **one** of the following :　　　　　　　　　　　　　　7
　　　　(i)　Define specific heat of the gas. Show that $C_p - C_v = R$. Where symbols have their usual meanings.
　　　　(ii)　Derive the relation between P, V and T in an adiabatic process for an ideal gas.
　　(b)　Attempt any **one** of the following :　　　　　　　　　　　　　　3
　　　　(i)　The initial volume of an ideal gas at 1 atm pressure is $2m^3$. It expands isothermally so that its volume becomes $3m^3$ find the work done by the gas.
　　　　(ii)　An ideal gas at 2 atm and 37^0 C is compressed adiabatically to 1 atm pressure. Calculate the resulting temperature. (Take ; $\gamma = 1\cdot4$).

3.　(a)　Attempt any **one** of the following :　　　　　　　　　　　　　　7
　　　　(i)　Derive an second order differential equation for a transvers wave propagating along positive X-direction.
　　　　(ii)　Explain the detection of an ultrasonic waves with the help of Kundt's tube. Also explain any one application of ultrasonic waves.
　　(b)　Attempt any **one** of the following :　　　　　　　　　　　　　　3
　　　　(i)　Calculate the frequency of the fundamental note emitted by piezoelectric crystal.
　　　　　　L = $2\cdot5$ mm,　Y = 10^{10} N/m^2,　$\rho = 2\cdot4$ gm/cc.
　　　　(ii)　An auditorium has a volume of 2500 m^3. It is required to have reverberation time of $1\cdot2$ sec. What is the total absorption in a Hall ?

4.　(a)　Attempt any **one** of the following :　　　　　　　　　　　　　　7
　　　　(i)　Two collinear SHM's represented by ;
　　　　　　Y_1 = acos (ωt - α)　and　Y_2 = b cos (ωt - β). Show that resultant amplitude is minimum.
　　　　(ii)　There are N particles of masses m_1, m_2, ... m_N with position vectors r_1, r_2, ...r_N. Derive an expression for the conservation of angular momentum.

⑥

[TURN OVER

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

   (i) A rocket has mass 500 Kg has initial fuel 1500 Kg. If the exhaust velocity of the fuel is 10 Km/s, calculate the burnt out velocity of the rocket. Assume initial velocity of rocket is zero.

   (ii) Draw Lissajous figures for time period in the ratio 1:2 for $\delta = \pi, \pi/2, \pi/4$.

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

   (i) Give the theory of interference in thin film. Derive an expression for the optical path difference.

   (ii) What is chromatic aberration ? Derive an expression for longitudinal chromatic aberration. 3

(b) Attempt any **one** of the following :

   (i) Determine the focal length of a thick lens having thickness 5 cm and radii of curvature are 10 cm and 8 cm. R.I. index = 1·5.

   (ii) Determine the radii of curvature for a lens of focal length 30 cm and RI 1·5 such that parallel incident rays have minimum spherical aberration.

7

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

   (i) Explain the principle of working of LASER.

   (ii) Explain in brief the working of the following :

     (1) Step index optical fibre

     (2) Graded index optical fibre. 3

(b) Attempt any **one** of the following :

   (i) Write properties of LASER.

   (ii) Give a brief account of applications of Optical fibre.

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F.Y.B.Sc. (Computer Sci.)

Con. 109-17.

Physics — Pp.-II

Mar 2017 MI-4587

(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 **non-programmable** calculator is **allowed.**

1. (a) Attempt any **one** of the following : 7
   (i) A.D.C source of e.mf (E) is applied to a series C-R circuit derive an expression for current decay and define time constant.
   (ii) For A.C define (1) Frequency (2)R.M.S value. Explain parallel L-C-R circuit and concept of resonance for this circuit.
   (b) Attempt any **one** of the following : 3
   (i) Calculate the capacitive-reactance of 20 μF capacitor for A.C signal of 50 Hz.
   (ii) An inductance of 4H and a resistance of 1 ohm are connected in series with a dc source of 6V. Find the current in the circuit 4 secs after the circuit is switched on.

2. (a) Attempt any **one** of the following : 7
   (i) State and explain the Bragg's law with the help of a neat diagram. Derive necessary relation.
   (ii) On the basis Bhor's postulates derive an expression for the radius of the nth orbit of an atom. 3
   (b) Attempt any **one** of the following :
   (i) What is the Radius and Energy of an electron in 5th orbit of the Hydrogen atom ? [Take radius of the 1st orbit as $a_0 = 5 \cdot 292 \times 10^{-11}$m].
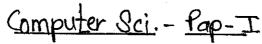   (ii) If the minimum wavelength of X-ray is $0 \cdot 47$ A^0. What will be the accelerating potential of the tube ?
   [$C = 3 \times 10^8$ m/sec, h $= 6.63 \times 10^{-34}$ J-sec, q $= 1 \cdot 6 \times 10^{-19}$C]. 7

3. (a) Attempt any **one** of the following :
   (i) Explain the construction and working of a half wave rectifier with the capacitor filter. What is ripple factor? Draw necessary output waveform.
   (ii) How will you add two binary numbers A and B using hall adder ? Draw circuit and write it's truth-table. 3
   (b) Attempt any **one** of the following :
   (i) Draw a neat diagram of transistor as an amplifier in CE-mode. Define current gain.
   (ii) Draw symbols of two derived gates, and write their truth-tables. 7

4. (a) Attempt any **one** of the following :
   (i) State and explain Maximum Power Transfer theorem. Under what condition its efficiency is 50% ?
   (ii) Show that in M.C.G current flowing through the coil is directly proportional to the deflection. 3
   (b) Attempt any **one** of the following :
   (i) In a De-Sauty's bridge, obtain the capacitance of the unknown capacitor if $R_2 = 2K$, $R_1 = 1 \cdot 5$ K and $C_2 = 0 \cdot 33$ μF.
   (ii) In Maxwell's inductance bridge $R_2 = 10 R_3$, if $L_2 = 100$mH, find unknown L_1.

[TURN OVER

7

5. (a) Attempt any **one** of the following :
   (i) State the law of radioactive decay. Define half-life time. Derive it's expression.
   (ii) Define Mass Number, Isotopes. Explain the concept of Nuclear Magnetic Resonance. 3
   (b) Attempt any **one** of the following :
   (i) Write a brief note on Radiometric dating.
   (ii) What is negative and positive beta-decay ?

7

6. (a) Attempt any **one** of the following :
   (i) What is Compton Effect ? Derive necessary expression.
   (ii) Explain gravitational red shift. 3
   (b) Attempt any **one** of the following :
   (i) Find the wavelength associated with an electron subjected to a potential difference of 1·25 KV. .
   (ii) What is the momentum of the X-ray photon of frequency 3 MHz ?

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F.Y.BSc. (Computer Sci.)

VT-Exam. Paper (IDOL)-Jan.-17-6

Con. 110-17.

Mar 2017

Computer Sci. - Pap-I

MI-4793

(2 Hours) [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

1. Attempt any **two** :
    (a) Explain with diagram the basic instruction cycle.   5
    (b) Convert the following :   5
        (i) $(1100100111011)_2 = (\ )_{10}$
        (ii) $(10011101)_2 = (\ )_8$
    (c) What is Computer ? State any two merits and demerits of Computer.   5

2. Attempt any **two** :
    (a) Draw logic symbol of OR and AND gate and write its truth table.   5
    (b) Write a short note on Multiplexer.   5
    (c) Explain Full Subtractor.   5

3. Attempt any **two** :
    (a) List different types of printer ? Explain any one in detaiL.   5
    (b) Explain the concept of virtual memory.   5
    (c) What are registers ? Explain any two types of registers ?   5

Section II

4. Attempt any **two** :
    (a) Write a 8085 program to put even numbers 0,2,4,6,8,10,12,14,16,18 in memory location   5
        starting from 2000 to 2009.
    (b) List the Branch Instruction in 8085 and explain any one in brief.   5
    (c) Draw the pin diagram of 8085 and give the description of any 5 pins .   5

5. Attempt any **two** :
    (a) What is operating system ? Explain any two functions of an operating system.   5
    (b) Explain Simple Batch Systems with the concept of resident monitor.   5
    (c) Explain Ready and Running state of five state process model.   5

6. Attempt any **two** :
    (a) What is multiprocessor system ? Explain the advantages of multiprocessor system   5
        over uniprocessor system.
    (b) What is I/O module ? Discuss the need of an I/O module system.   5
    (c) Write a short note on Multiport memory.   5

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Mar 2017

MI-4932

Computer Sci - Pap-II

(2 Hours)   [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

1. Attempt any **two** :
    (a) Explain the concept of variable and constants.   5
    (b) How to calculate the running time of an algorithm ?   5
    (c) Write an algorithm to reverse the digits of a given number.   5

2. Attempt any **two** :
    (a) Explain arithmetic and relational operators with an example.   5
    (b) Explain following functions :   5
        printf(), scanf(), getch(), gets(), getc()
    (c) Write a C program to calculate the factorial of a given number.   5

3. Attempt any **two** :
    (a) What is a structure ? How it is defined in C ?   5
    (b) Explain any 3 string handling functions.   5
    (c) Write a program in C to create structure to find and print the average marks of five   5
        subjects alongwith the name of student.

Section II

4. Attempt any **two** :
    (a) Explain Bubble sort algorithm.   5
    (b) Define recursion. Explain with suitable example.   5
    (c) Differentiate between functions and macros.   5

5. Attempt any **two** :
    (a) Explain the following with an example :   5
        calloc(), malloc() and free()
    (b) What do you mean by pointers ? Explain with an example.   5
    (c) Explain the following functions :   5
        fwrite(), fseek(), getw(), putw(), fread()

6. Attempt any **two** :
    (a) Explain the working of queue data structure with an example.   5
    (b) How to represent linked list in memory ?   5
    (c) Write an algorithm to insert a node in the beginning of a linked list.   5

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(11)