

F.Y.B.Sc. C.S
Jan-2019 = F.C

F.Y.B.Sc (C.S.)
Foundation course (I)

Jan
2019

Con. 534-18.

2
(3 Hours)

AL-6113
Total Marks : 100

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

1. Explain the multi lingual and multi religious nature of Indian society. 15
OR

Write notes on each of the following:

- (a) Portrayal of women in media
(b) Causes of declining sex ratio
(c) Levels of mental disability
2. Bring out the causes, consequences and measures to control communalism in India. 15
OR

Write notes on each of the following:-

- (a) Structure of the Indian Constitution
(b) Fundamental duties of Indian Citizen
(c) Values of Tolerance, Peace and Communal harmony
3. Write a note on Urban Local Self Government. 20
OR

Write notes on any two of the following:-

- (a) Causes and effects of alcoholism
(b) Causes and effects of child abuse
(c) Causes of the problems of Elderly
4. Explain in detail the positive and negative impact of Information Technology. 15
OR

Write notes on each of the following:-

- (a) Concept of Human Rights
(b) Right to Liberty
(c) Right to Constitutional remedies
5. Write a note on Sustainable Development. 15
OR

Write notes on each of the following:-

- (a) Agents of socialization
(b) Significance of ethics, values and prejudices in developing the individual
(c) Techniques for prevention and control of aggression
6. Explain Maslow's theory of self actualization. 20
OR

Write notes on any two of the following:-

- (a) Changing lifestyle and impact on culture
(b) Advantages and disadvantages of Genetically modified crops
(c) Increasing crime and suicide among youth

Con. 534-18.

(3 Hours)

AL-6113
Total Marks : 80

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

Q. 1 Answer any four questions from the following: (16)
a) India as a multi-religious nation
b) Problem of declining sex ratio in India
c) Characteristics of Tribal and Rural areas in India
d) Forms of violence against women
e) Portrayal of women in media
f) Categories of physical disability

Q. 2 Answer any four questions from the following: (16)
a) Causes of Communalism in India
b) Measures to control casteism
c) Meaning and causes of Regionalism in India
d) Mention any eight schedules of Indian Constitution
e) Briefly explain any four fundamental duties of Indian citizens
f) Any four basic features of Indian Constitution

Q. 3 Answer any four questions from the following: (16)
a) Role of women in politics
b) Problems of the elderly
c) Causes and effects of child labour
d) Impact of globalization on industries
e) Growth of Corporate farming
f) Right to constitutional remedies

Q. 4 Answer any four questions from the following: (16)
a) Functions of Ecosystem
b) Impact of environmental degradation on human life
c) Concept of sustainable development
d) Causes of stress and conflict in Indian society
e) Agents of socialization
f) Techniques for prevention and control of aggression

Q. 5 Answer any four questions from the following: (16)
a) Conflict management mechanism
b) Maslow's theory of self actualization
c) Efforts towards building of harmony and peace in society
d) Impact of mass media on culture
e) Causes of farmer's suicide in India
f) Increasing crime and suicide among youth

[Turn Over

F.Y.B.Sc. C.S
Jan - 2019

maths - I

F.V.B.Sc.(C.S.)

AL-6348

Con. 547-18.

(3 Hours)

Maths - I

Total Marks : 80

Jan
19

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

Q.1 Attempt any FOUR of the following.

16M

- a) Show that $\lim_{x \rightarrow 0} \frac{1}{x}$ does not exist.
- b) Check the continuity of $f(x)$ at $x=0$ where $f(x) = 2x+5$ if $x \leq 0$
 $= x+1$ if $x > 0$
- c) Use definition to find derivative of $f(x) = 8 - x^2$.
- d) Show that every differential function are continuous.
- e) Find critical value of function $f(x) = x^4 - 18x^2 + 4$.
- f) Find Taylor's polynomial of degree 3 generated by $f(x) = \cos x$ at $x=0$.

Q.2 Attempt any FOUR of the following.

16M

- a) Show that $|a+b| \leq |a| + |b|$ where a and b are real number.
- b) Using definition evaluate $\lim_{x \rightarrow \sqrt{5}} x^4 = 25$.
- c) Find tangent and normal to the curve $x^2 + xy - 2y^2 = 12$ at the point (2,3).
- d) Calculate third order derivative of $\sin^2(x)$.
- e) Find asymptotes of $y = \frac{x^2}{\sqrt{x^2 - 4}}$.
- f) Verify CMVT for the function $f(x) = \sin x$ and $g(x) = \cos x$ on $\left[0, \frac{\pi}{2}\right]$.

16M

Q.3 Attempt any FOUR of the following.

- a) State sandwich theorem and hence evaluate $\lim_{(x,y) \rightarrow (0,0)} \frac{x^3}{x^2 + y^2}$.
- b) Define the level curves of the function of two variables and plot the level curves of $f: \mathbb{R}^2 \rightarrow \mathbb{R}$ is given by $f(x,y) = 4 - x^2 - y^2$.
- c) Find a vector which is perpendicular to the plane containing the points A(-1, -1, 0), B(2, 2, -1) and C(-3, 1, 2).
- d) Define Spherical coordinates. Further, give relation between Cartesian co-ordinate, polar co-ordinates and Spherical Co-ordinates.
- e) Discuss the continuity of $f(x, y, z) = 3x - y^2 + e^z$ at (1, 1, 0).
- f) Find the minimum value of $x^2 + y^2 + z^2$ when $x+y+z=3a$.

TURN OVER

Q.4 Attempt any FOUR of the following.

16M

- a) Find the area of parallelogram formed by \overline{AB} and \overline{AC} if $A=(2, 1, 2)$ $B=(3, 2, 1)$ and $C=(5, 5, 1)$.
- b) Find angle between any two diagonals of a cube by using vector method.
- c) Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ if $f(x, y) = \frac{x^2 y}{\sqrt{x^2 + y^2}}$.
- d) Using two path test check whether $\lim_{(x,y) \rightarrow (0,0)} \left[\frac{x^3 - y^3 x}{x^2 + y^2} \right]$ exist or not.
- e) Find the linearization of $f(x, y) = x^2 - xy + \frac{y^2}{2} + 3$ at a point $(3, 2)$.
- f) If $z = \cos(x^2 y^2)$ then find $\left(\frac{\partial z}{\partial x} \right)^2 + \left(\frac{\partial z}{\partial y} \right)^2$.

Q.5 Attempt any FOUR of the following.

16M

- a) Define ceiling function and draw its graph.
- b) If $y = \tan^{-1} x$ then prove that $(1+x^2)y_2 + 2xy_1 = 0$.
- c) Verify Rolle's mean value theorem for $f(x) = x^2$ in the interval $[-1, 1]$.
- d) Find equation of plane passing through the point $(1, 2, 3)$ and having the normal vector $\hat{i} - 2\hat{j} + \hat{k}$.
- e) Using polar co-ordinate evaluate $\lim_{(x,y) \rightarrow (0,0)} \frac{x^3}{x^2 + y^2}$.
- f) If $u = \log(x^2 + y^2)$ then show that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$.



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

Q.1 Attempt any ONE of the following.

- a) State and prove Leibnitz Theorem of differentiability. 10M
 b) If a line in space makes an angle A, B, C, D with the diagonals of cube then show that 10M

$$\cos^2 A + \cos^2 B + \cos^2 C + \cos^2 D = \frac{4}{3}$$

Q.2 Define Absolute function and draw its graph and Show that it is not continuous at x=0. 8M
 Show that differentiable function is continuous. Is the converse true? Justify. Check the 7M

- b) differentiability of function at x=0 where $f(x) = x \cos\left(\frac{1}{x}\right)$ x = 0
 = 0 x = 0
 c) Discuss the continuity of the function in the domain [0, 3]. 7M

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

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

- Q.3 a) Find the tangent and normal to the curve $x^2 + xy - y^2 = 1$ at a point (2, 3). 8M
 b) Calculate nth order derivative of $y = (ax + b)^m$ $m \in \mathbb{N}$. 7M
 c) If $b^2x^2 + a^2y^2 = a^2b^2$ then prove that $3y_1 \cdot y_2 + y \cdot y_3 = 0$ 7M

- Q.4 a) State and prove Rolle's theorem of differentiability. 8M
 b) Use Taylor's theorem to prove that $\frac{1-x^2}{2!} \leq \cos x \leq 1 - \frac{x^2}{2!} + \frac{x^4}{4!}$. 7M
 c) Find the values of x for which function $f(x) = 2x^3 - 9x^2 - 24x + 69$ is 1) increasing 7M
 2) decreasing

- Q.5 If a line makes directed angle α, β, γ with axes, then prove that 8M
 a) i) $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 2$ ii) $\cos 2\alpha + \cos 2\beta + \cos 2\gamma = 2$.
 b) Find the direction cosine of a line which is equally inclined to the Co-ordinate axes. 7M
 c) Show that the lines $\vec{r} = (2, 1, -2) + s(3, -5, 2)$ and $\frac{x}{2} = \frac{y}{-3} = \frac{z}{1}$ are skew lines. Also find 7M
 Shortest distance between them.

Q.6

- a) State Sandwich theorem and find $\lim_{(x,y) \rightarrow (0,0)} y \cos \frac{1}{x}$. 8M
- b) Define the level curves of the function of two variables and plot the level curve of $f: \mathbb{R}^2 \rightarrow \mathbb{R}$ is given by $f(x, y) = 2x + 4y$ and $c = 0, 1$. 7M
- c) Evaluate the limit by using polar co-ordinates. 7M
- i) $\lim_{(x,y) \rightarrow (0,0)} \cos \left[\frac{x^3 - y^3}{x^2 - y^2} \right]$ ii) $\lim_{(x,y) \rightarrow (0,0)} \left[\frac{x^2 - y^2}{x^2 + y^2} \right]$

Q.7

- a) Find the minimum value of $x^2 + y^2 + z^2$ when $x + y + z = 3a$. 8M
- b) Find all second order partial derivatives $f(x, y) = x \cos y + ye^x$. 7M
- c) Define linearization and Find the linearization of $f(x, y) = y \cos x - x \sin y$ at a point. 7M

F.Y.B.Sc. CS

Jan. 2019

= Math - II

F.Y.B.Sc (C.S.)

(Maths - II)

Jan
2019

Con. 556-18.

(3 Hours)

AL-6457

Total Marks : 80

N.B.i) All questions are compulsory.

ii) Figures to the right indicates full marks.

iii) Internal choices are there in questions.

iv) Each question carries 16 marks. And each sub question carries 4 marks.

Qu-1 Attempt any four of the following:

(16)

- Prove that any integer of the form $6k + 5$ is also of the form $3k + 2$ but not conversely.
- Find L.C.M. and G. C. D. of 24 and 76.
- Prove that if a/b and b/c then a/c .
- State the Pascal rule and write triangle for $n = 6$.
- For $a, b \in \mathbb{N}$ if $\text{G.C.D.}(a, b) = 1$. Prove that $\text{G.C.D.}(a + b, a - b) = 1$ or 2 .
- Prove that number of permutation of n symbols is $n!$.

Qu-2 Attempt any four of the following:

(16)

- Show that if any 29 people are selected then one may choose subset of 5, such that all 5 were born on the same day of the week.
- Show that the function of $f: \mathbb{Q} \rightarrow \mathbb{Q}$ given by $f(x) = 9x - 4$, $x \in \mathbb{Q}$ is bijective.
- Let $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x + 1$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ defined by $g(x) = x^2$ for all $x \in \mathbb{R}$ Find gof & fog .
- Prove that for any three sets A, B & C $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$
- Define the identity function and give two examples of it.

Qu-3 Attempt any four of the following:

(16)

- Prove that $6! \equiv -1 \pmod{7}$
- If $n > 1$, Show that $n!$ is never a perfect square.
- Calculate $\phi(720)$.
- Solve equation $4x \equiv 3 \pmod{7}$.
- Prove that 41 divides $2^{20} - 1$.
- State and prove Fermat's little theorem.

[Turn over

7

Qu-4 Attempt any four of the following:

(16)

a) Write down all partitions of the set $A = \{1, 2, 3\}$ and hence state the total number of equivalence relation in A.

b) How many different letters words can be formed by using the letters of the word "SEMISIMPLE"

c) Find the number of positive integers from 1 to 200 which are divisible by 2,3 or 7.

d) write the cycle notation of the following permutations .

$$\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 1 & 5 & 6 & 4 & 8 & 7 \end{pmatrix}, \beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 5 & 3 & 7 & 6 & 4 & 2 & 1 \end{pmatrix}$$

e) Solve the recurrence relation $a_n = -3 a_{n-1} - 2 a_{n-2}$; $a_1 = -2, a_2 = 4$

f) Find the coefficient of $x^2 y^3 z^2$ in the expansion of $(2x - y^2 + 2z)^5$?

Qu-5 Attempt any four of the following:

(16)

a) Find the cube root of $1 + i$.

b) Prove that nth roots of unity are in G.P.

c) If sum of two roots of polynomial $x^3 - x^2 - 4x + 4$ is zero then find its all roots .

d) Find the gcd of $f(x) = x^3 - 2x^2 + 3x - 7$ and $g(x) = x^2 - 2x - 3$ in $\mathbb{Q}[x]$.

e) Prove that $\cos 5A = 16 \cos^5 A - 20 \cos^3 A + 5 \cos A$.

f) Find all roots of equation $x^4 - 1 = 0$.

N.B.i) All questions are compulsory.

ii) Figures to the right indicates full marks.

iii) From question 2 to 7, sub question a is compulsory and attempt any two from b, c, d

Qu – 1 Attempt any one of the following:

- a) Prove that for given integers a and b with $b > 0$, there exist unique integers q and r satisfying $a = qb + r$ where $0 \leq r < b$ (10)
- b) Prove that the number of permutation in a set S_n is $n!$ that is $|S_n| = n!$ (10)

Qu – 2 Attempt the following

- a) For given integers a and b ; not both zero, prove that there exist integers x and y such that $\gcd(a, b) = ax + by$ (7)
- b) For $a, b \in \mathbb{N}$, prove that if a/b and b/a then $a = b$. (4)
- c) Express 1450 and 1176 as the product of powers of same prime numbers. (4)
- d) State Pascal rule and write Pascal triangle for $n = 5$. (4)

Qu – 3 Attempt the following:

- a) Prove the inverse of one – to-one function is one-to-one and onto. Also find the inverse of one-to- one onto function $f: \mathbb{R} \rightarrow \mathbb{R}$ given by $f(x) = 2x + 3$ for every $x \in \mathbb{R}$. (7)
- b) Check whether the binary operation defined on corresponding set is commutative or associative. $a * b = a + b - 3$ for every $a, b \in \mathbb{Z}$. (4)
- c) Show that if 30 dictionaries in a library contain a total of 61,327 pages, then one of the dictionary must have at least 2045 pages. (4)
- d) Find the cardinal number of each set
- i) $A = \{1, 5, 11, -3, -28\}$ ii) $B = \{a, b, c, \dots, y, z\}$
- iii) $C = \{x / x^2 = N \text{ and } x^2 = 7\}$ iv) $D = \{10, 20, 30, 40, \dots\}$ (4)

[Turn over.

Qu - 4 Attempt the following:

- a) If a, b, c, d are integers and n is a fixed positive integer then if $a \equiv b \pmod{n}$ and $b \equiv c \pmod{n}$ then prove that $a \equiv c \pmod{n}$ (7)
- b) Solve $3x \equiv 12 \pmod{15}$ (4)
- c) Find last digit of 13^{516} (4)
- d) Calculate $\phi(1001)$ (4)

Qu - 5 Attempt the following:

- a) If X is a non-empty set and R is an equivalence relation on X , then prove that the distinct equivalence classes form a partition of X . (7)
- b) R is a relation on Z defined as $(x, y) \in R$ if $3x + 4y$ is divisible by 7. Determine whether R is an equivalence relation. (4)
- c) A committee of 12 is to be selected from 10 men and 10 women. In how many ways can the selection be carried out if there must be six men and six women? (4)
- d) Write all derangements on $S = \{1, 2, 3\}$ (4)

Qu - 6 Attempt the following:

- a) Find the type of permutation in s_9 . Also find number of permutation of that type.
 $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 3 & 4 & 6 & 1 & 8 & 2 & 5 & 7 & 9 \end{pmatrix} \quad \beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 5 & 1 & 9 & 3 & 8 & 2 & 7 & 6 & 4 \end{pmatrix}$ (7)
- b) How many different letter words can be formed using letters of the word "MISSISSIPPII"? (4)
- c) Find the number of integers from 1 to 150 which are not divisible by 2, 3 and 7. (4)
- d) Find the coefficient of $(3a)^2(4b)^3(-c)^2$ in the expansion of $(3a + 4b - c)^7$ (4)

Qu - 7 Attempt the following:

- a) Prove that if a polynomial $f(x) \in R[x]$ is divided by $(x - \alpha)$ then remainder is $f(\alpha)$ (7)
- b) Find the gcd of $f(x) = x^3 - 3x^2 - 2x - 6$ and $g(x) = x^3 - 2x^2 - 2x - 3$ in $Q[x]$. (4)
- c) Find all cube roots of $27i$. (4)
- d) Find the value of $[2(\cos \frac{\pi}{5} + i \sin \frac{\pi}{5})]^5$ (4)

-----Best of Luck-----

F.Y. B.Sc CS
Jan - 2019

= Physics - I
~~F.Y. B.S. (C.S.)~~
(Physics - I)

Jan
2019

Con. 536-18.

(OLD COURSE)

AL-6479

(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) State Newton's laws of Motion. Mass m_1 is placed on a smooth horizontal surface and is connected to mass m_2 by inextensible string of negligible mass passing over a smooth pulley. Show that tension in the string is

$$T = \frac{m_1 m_2}{m_1 + m_2}$$

(ii) With suitable diagram, show that $Y = 2\eta(1 + \sigma)$.

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

3

(i) Calculate the horizontal force required to move the metal plate of area $2 \times 10^{-2} \text{ m}^2$ with 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 viscosity of oil is $2\text{PI}(= \text{NS/m}^2)$.

(ii) A metal wire of length L , radius r is stretched. Assuming that the volume of the wire is unchanged. Show that Poisson's ratio is $\frac{1}{2}$.

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

7

(i) Discuss the concept of internal energy. Obtain first law of Thermodynamics and discuss path dependence of heat.

(ii) Derive expression for work-done by a perfect gas in an adiabatic change.

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

3

(i) The initial volume of certain mass of ideal gas at 1 atm pressure is 2m^3 . It expands isothermally so that its volume becomes 3m^3 . Calculate the work done by the gas.

(ii) State and explain Zeroth law of thermodynamics.

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

7

(i) Define wave and wave motion. Obtain equation for wave motion in one dimension.

(ii) Explain with neat diagram how ultrasonic waves are produced ? (any one method).

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

3

(i) If the reverberation time in an auditorium of 100 m long, 40 m wide and 15 m high is 1.5 sec. Find the coefficient of absorption if area of auditorium is $4 \times 10^4 \text{ m}^2$.

(ii) Discuss any three factors affecting the architectural acoustics.

[TURN OVER

4. (a) Attempt any **one** of the following :- 7
- (i) Obtain an expression for the composition of the two perpendicular SHMs of same period.
 - (ii) Show that for a system of particles angular momentum of a system of particles is conserved.
- (b) Attempt any **one** of the following :- 3
- (i) What are Lissajous figures ?
 - (ii) A conveyor belt is used to move material at the rate of 1000 Kg per min at a constant velocity of 2 m/s. Calculate force required and power supplied.
5. (a) Attempt any **one** of the following :- 7
- (i) In case of thin convex lens show that the minimum distance between object and image must be greater than $4f$.
 - (ii) What do you mean by Aberration ? Explain spherical Aberration.
- (b) Attempt any **one** of the following :- 3
- (i) Draw neat diagram showing experimental arrangement for Newton's rings.
 - (ii) Determine the focal length of a thick lens of thickness 5 cm and radii of curvature are 10 cm and 8 cm $R.I. = 1.5$.
6. (a) Attempt any **one** of the following :- 7
- (i) What is LASER ? Explain absorption, spontaneous emission and stimulated emission in case of LASER.
 - (ii) Explain in detail the application of fiber optics in communication system.
- (b) Attempt any **one** of the following :- 3
- (i) Give uses of optical fiber.
 - (ii) Write any three application of LASER.
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- 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 particle of mass 2.5 Kg at rest at origin experiences a force $F = (\hat{i} 10 + \hat{j} 15) \text{ N}$. Determine the position at time 4 sec.
- (b) Explain the terms modulus of rigidity and Poisson's ratio.
- (c) For the steady flow of liquid derive the Poiseuille's equation.
- (d) A metal wire of length L, radius is stretched. Assuming that the volume of the wire is unchanged. Show that Poisson's ratio is $\frac{1}{2}$.
2. Attempt any two of the following :- 10
- (a) Explain the terms : isobaric, isochoric, isothermal and adiabatic.
- (b) What is meant by phase transition ? Show that the change in internal energy of a substance, when its phase change is given by $dU = mL - P(V_2 - V_1)$.
- (c) Explain the terms population inversion and optical pumping in case of LASER.
- (d) Explain the brief the working of Step-index optical fiber and graded index optical fiber.
3. Attempt any two of the following :- 10
- (a) Explain the Kundt's tube method for the detection of ultrasonic waves.
- (b) What are the factors affecting the architectural acoustics.
- (c) Obtain an expression for longitudinal waves on a rod.
- (d) An auditorium has a volume 3000 m^3 . It is required to have reverberation time of 1.5 sec. What should be the total absorption of the hall ?
4. Attempt any two of the following :- 10
- (a) Obtain an expression for the compositions of the two perpendicular SHMs of same period.
- (b) Two collinear SHMs having the same period but different amplitude and phase are described by $y_1 = a \cos(\omega t - \alpha)$ and $y_2 = b \cos(\omega t - \beta)$. Find their composition in amplitude and phase. When will the amplitude of resultant be minimum and maximum.
- (c) Show that total angular momentum in a system of particles is conserved.
- (d) Write a short note on Conveyor belt.

5. Attempt any two of the following :-

10

- (a) In case of thin convex lens show that angle of deviation depends on height at which incident rays meet and focal length of the lens.
 - (b) What is Achromatism ? Discuss the condition for achromatism.
 - (c) Draw neat ray diagram showing experimental set of Newton's ring.
 - (d) A double convex lens has equal radii and has focal length of 80 cm. If R. I. of the material of the lens is 1.5. Find radii of curvature.
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F.Y. B.Sc C.S
Jan-2019

= Physics - II

F.Y. B.Sc (C.S.)

Physics - II

Jan
2019

Con. 555-18.

AL-6203

(2 Hours)

[Total Marks : 48

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

1. Attempt any two :— 8
- Explain in brief with phasor diagram 'Resonance' in series L-C-R circuit.
 - State and explain Moseley's Law.
 - Write a note on Transistor as an amplifier.
 - Define Half life time; derive required relation.
2. Attempt any two out of the following :— 10
- Explain the discharge of a capacitor (C) through a register (R); assuming a capacitor his fully-charged by a d.c source of e.m.f. E.
 - A source of e.m.f E, is connected across a series combination of an inductor (L) and a resister (R). Find the growth of a current.
 - Define for AC : Frequency, Average value, What value of C resonates with a $300\mu\text{H}$, inductance of 1500 kHz .
 - V_{p-p} of a sine wave is 400v . Find the average value and r.m.s value of the voltage.
3. Attempt any two out of the following :— 10
- With the help of a diagram explain in brief Modern Coolidge tube.
 - Explain the Correspondence principle.
 - The half-life of Radon is 4 days. How long will a sample of Radon take to decay to 10% of its initial value ?
 - Discuss the different types of radioactive decay.
4. Attempt any two out of the following :— 10
- Using logic diagram and the truth-table explain Half-adder.
 - Draw a diagram of LC-filter, Write it's ripple factor. State it's advantages.
 - Explain input characteristics of a transistor in CE-mode.
 - A Zener regulator the value of $R_s = 240\Omega$, $V_z = 12\text{v}$, $R_L = 500\Omega$ and $V_i = 30\text{V}$. Find (a) Load voltage (b) current through zener diode.
5. Attempt any two out of the following :— 10
- Explain Maxwell's inductance bridge.
 - What is Compton Effect ? Explain the experiment with the help of a suitable diagram.
 - In De-Sauty's bridge; if $R_1 = 1.5\text{k}$, $R_2 = 2.0\text{k}$ and $C_2 = 0.33\mu\text{F}$. Find the capacitance of the unknown capacitor.
 - Calculate the energy of neutron having a de Broglie wavelength 10^{-14}m .
Given : The rest mass of a neutron is $1.6 \times 10^{-27}\text{ kg}$; $h = 6.69 \times 10^{-34}\text{ S.I. Unit}$.

[TURN OVER

15

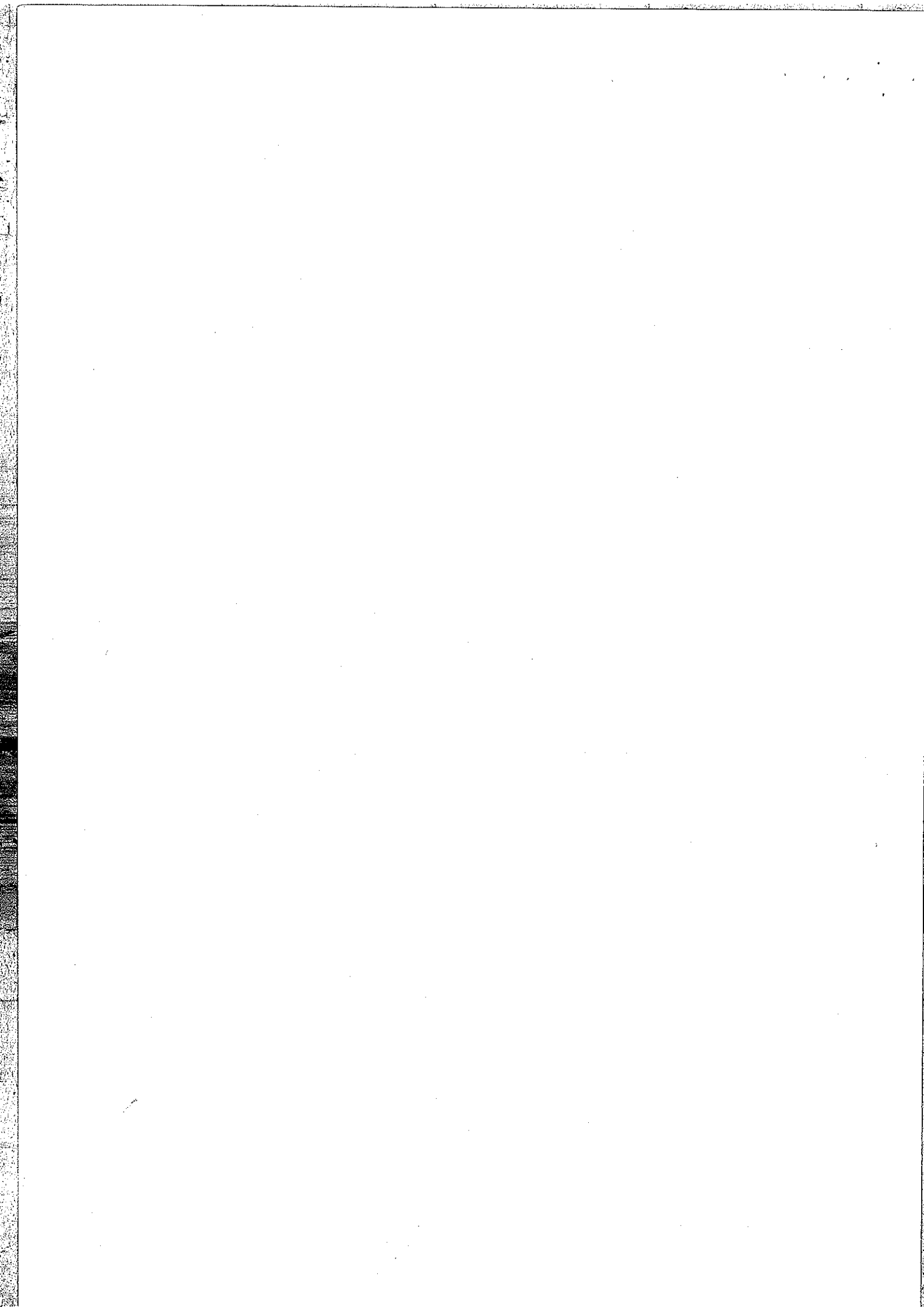
(2 Hours)

[Total Marks : 60

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

1. (a) Attempt any **one** :— 7
 (i) A source of e.m.f. E (d.c) is connected to a series C-R circuit. Derive necessary relation to charging is exponential. Define time-constant.
 (ii) Explain series L-C-R circuit and concept of resonance for this circuit.
- (b) Attempt any **one** :— 3
 (i) What is the capacitor if A.C signal of 50Hz connected to a capacitor of capacitive reactance 159.2Ω .
 (ii) A dc voltage of 80V is applied across a series combination of 5Ω resistance and 20H inductance. Find the rate of growth of current at the instant if the current is 6A.
2. (a) Attempt any **one** :— 7
 (i) Derive the Bragg's law of x-ray diffraction.
 (ii) Write a short note on Rutherford's nuclear atom model.
- (b) Attempt any **one** :— 3
 (i) Draw Lyman, Balmer and Pascher series for hydrogen atom.
 (ii) Distinguish between characteristic and continuous x-ray.
3. (a) Attempt any **one** :— 7
 (i) Explain the construction and working of a Full adder.
 (ii) Explain half-wave rectifier with capacitor filter.
- (b) Attempt any **one** :— 3
 (i) Define (a) current amplification factor
 (b) Input resistance of a transistor.
 (ii) Explain NAND-gate.

4. (a) Attempt any one :— 7
- (i) State and prove Maximum transfer theorem.
 - (ii) Explain Maxwell's inductance bridge.
- (b) Attempt any one :— 3
- (i) In a De-Sauty's bridge, if $R_1 = 1.5k$, $R_2 = 2k$ and $C_2 = 0.33 \mu F$; Find the capacitance.
 - (ii) Wien Bridge has two capacitors each of $0.02 \mu F$. What is applied frequency if resistances are $10k\Omega$?
5. (a) Attempt any one :— 7
- (i) State the law of radioactive decay. Define the term half-life; derive the expression for the same.
 - (ii) Explain the following properties of the nuclear.
 - (a) Nuclear force (b) Atomic Number
 - (c) Isotopes (d) Nuclear spin.
- (b) Attempt any one :— 3
- (i) A radioactive substance decays to $\left(\frac{1}{5}\right)^{th}$ of its original value in 56 days. Find its decay constant.
 - (ii) The decay constant of a radioactive substance is 4.33×10^{-4} per year. Calculate its half life.
6. (a) Attempt any one :— 7
- (i) What is 'Compton shift' ? Derive necessary relation.
 - (ii) Explain the concept of pair production and Annihilation.
- (b) Attempt any one :— 3
- (i) Find the wavelength of a proton accelerated by a potential difference of 50V.
 [$m_p = 1.673 \times 10^{-27} \text{ kg}$] [$h = 6.63 \times 10^{-34} \text{ J-S}$]
 - (ii) What is the frequency of x-ray photon whose momentum is $1.1 \times 10^{-23} \text{ kgm/sec}$? Given : $c = 3 \times 10^8 \text{ m/sec}$.
-



F.Y.B.Sc. CS
Jan - 2019 = Comp Sci - I

Con. 538-18.

AL-6897

(2 Hours)

Total Marks : 48

F.Y.B.Sc (C.S)
(COMP. Sci - I)

Jan
2019

- NOTE 1) ALL Questions are compulsory.
2) Figure to the write Indicates Full Marks.
3) Mixing of Sub Questions is not Allowed.

SECTION I

- Q1) Answer any two Questions from the Following. 08
- a) Perform the Following binary Subtraction using 2's Compliment Method.
 - 1) 1010101 - 1001010
 - 2) 1000100 - 1000100
 - b) Write a short note on RS Flip Flop.
 - c) Write a short note on cache memory.
 - d) What is Hex decimal Numbering System? Convert $(BC)_{16}$ into Decimal and Octal Number.
- Q2) Answer any two Questions from the Following. 08
- a) State And Explain the Two Types of Ram.
 - b) Write Short note on Magnetic Hard Disk
 - c) State The Advantages and Di-Advantages of Optical CD Rom
 - d) What is Multiplexer? Explain the Operations of 2:1 Mux.
- Q3) Answer any two Questions from the Following. 08
- a) Explain the use of NAND gate as universal Building block.
 - b) State and Prove De-Morgan's II nd Law.
 - c) Explain with Suitable Diagram and truth table Working of Full Adder.
 - d) Write a Short note on Floppy Disk.

SECTION II

- Q1) Answer any two Questions from the Following. 08
- a) Explain the flag register of 8085.
 - b) Explain Direct Memory Access.
 - c) What is Memory Management Explain?
 - d) Explain the addressing Modes of 8085.
- Q2) Answer any two Questions from the Following. 08
- a) Define OS and Write its Function.
 - b) Explain the Data transfer Instructions with Examples.
 - c) Explain with neat Diagram Fetch and Execute Cycle
 - d) Explain What is Process Scheduling
- Q3) Answer any two Questions from the Following. 08
- a) Draw block diagram of 8086 and explain.
 - b) Explain the Following Instructions With the help of Examples
 - 1) DAA 2) ADD M 3) CMP M 4) RRC
 - c) Explain how instructions are grouped based on their length
 - d) Write a Program in 8085 two subtracts two numbers present in memory location C500 and C501 Store the result in C502.

TURN OVER

- NOTE
- 1) ALL Questions are compulsory.
 - 2) Figure to the write Indicates Full Marks.
 - 3) Mixing of Sub Questions is not Allowed.
 - 4) Draw Diagram Where ever Necessary

SECTION I

- Q1) Answer any two Questions from the Following. 10
- a) Perform the Following binary Subtraction using 2's Compliment Method.
 - 1) 1110001 - 1000011
 - 2) 0100100 - 1010101
 - b) Write a short note on JK Flip Flop.
 - c) Write a short note on Virtual memory.
- Q2) Answer any two Questions from the Following. 10
- a) State And Explain the Types of Rom.
 - b) Write Short note on Magnetic Floppy Disk
 - c) Write a Short note Optical CD Rom
- Q3) Answer any two Questions from the Following. 10
- a) Explain the NAND and NOT gate with circuit diagram and Truth Table.
 - b) Explain the fetch and Execute Cycle
 - c) State with suitable Diagram and Truth table Working of Full Adder.

SECTION II

- Q1) Answer any two Questions from the Following. 10
- a) Explain the flag register of 8085 With Labeled Diagram.
 - b) Explain the system bus with the help of diagram.
 - c) Explain the addressing Modes of 8085 with examples.
- Q2) Answer any two Questions from the Following. 10
- a) Define OS and Write its Function.
 - b) Explain the Arithmetic Instructions with Examples.
 - c) Explain What is Scheduling
- Q3) Answer any two Questions from the Following. 10
- a) Draw block diagram of 8086 and explain.
 - b) Explain the Following Instructions With the help of Examples
 - 1) STA Address 2) ADDR 3) CMP R 4) RLC 5) ANA R
 - c) Write a Program in 8085 for addition of two numbers present in memory location C500 and C501 Store the result in C502.

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F.Y.B.Sc (C.S.)
COMP. Sci - II

Con. 541-18.

AL-6684

(2 Hours)

[Total Marks : 48.]

- N.B. :** (1) All questions are compulsory.
(2) Figures to the right indicate full marks.
(3) Illustrations, in-depth answers and diagrams will be appreciated.
(4) Mixing of sub-questions is not allowed.

Section I

1. Answer any two questions from the following :—

8

- Write an algorithm to swap two numbers.
- What are data types ? Explain the two different classes of data types supported by C.
- Explain the use of printf and scanf function in c with example.
- 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. Answer any two questions from the following :—

8

- Give the output of the given code :

```
#include <stdio.h >
int main ()
{
int a = 10, b = 4,c;
c = a+b;
a++;
b+=2;
printf("a:%d b:%d c:%d",a,b,c);
}
```

- Explain the concept of do while loop with its syntax and example.
- What are ternary operators ? Explain with example.
- Write a program to print the following pattern.

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

[TURN OVER

3. Answer any **two** questions from the following :—

- (a) Write a program to display largest element of an array where the elements of an array is to be given by user.
- (b) What are strings ? How it can be declared and initialized ? Explain with example.
- (c) What is Merge Sort ? Give the algorithm to perform Merge Sort.
- (d) Write a program to count number of vowels in a given string.

8

Section II

4. Answer any **two** questions from the following :—

- (a) Explain the concept of recursion with the help of an example.
- (b) Define function with its syntax and example.
- (c) Write a note on Structure.
- (d) What a register variables ? Explain how they can be declared in C.

8

5. Answer any **two** questions from the following :—

- (a) What is the output of this C code ?

```
#include<stdio.h>
void main ()
{
int k = 5;
int *p=&k;
int **m = &p;
printf("%d%d%d\n",k, *p, **m);
}
```

- (b) Explain fseek () with the help of its syntax and example.
- (c) Explain the functionality of malloc () function with syntax.
- (d) What will be the content of 'file.c' after executing the following program ?

```
#include<stdio.h>
int main ( )
{
FILE *fp1, *fp2;
fp1=fopen("file.c", "w");
fp2=fopen("file.c", "w");
fputc('A', fp1);
fputc('B', fp2);
fclose(fp1);
fclose(fp2);
return 0;
}
```

8

6. Answer any **two** questions from the following :—

- (a) Explain the significance of the operation when an item is added in a queue.
- (b) Differentiate between LIFO and FIFO list.
- (c) Define the concept of stack and also specify when stack is considered to be in overflow and underflow condition.
- (d) Write an algorithm to count the number of elements in a linked list.

8

(2 Hours)

[Total Marks : 60]

- N.B. :** (1) All questions are **compulsory**.
(2) **Figures** to the **right** indicate **full** marks.
(3) Illustrations, **in-depth** answers and diagrams will be appreciated.
(4) Mixing of **sub-questions** is not **allowed**.

Section I

1. Answer any **two** questions from the following :— 10
(a) Explain Divide and Conquer approach.
(b) What are variables in C ? How they can be declared and initialized ? Explain with example.
(c) Write a note on basic structure of C program.
2. Answer any **two** questions from the following :— 10
(a) Explain the concept of while loop with example.
(b) Explain scanf and gets function in C with example.
(c) Give the output of the given code snippet.

```
# include <stdio.h>
main ()
{
int a=8,b=5;
a=b++;
(a<b)?printf("a:%d",a):printf("b:%d",b);
return 0;
}
```
3. Answer any **two** questions from the following :— 10
(a) Write a program to implement insertion sort in C.
(b) Explain two-dimensional array with example.
(c) Name the function that returns the length of a string and explain it with example.

Section II

4. Answer any **two** questions from the following :— 10
(a) Explain the category of function without return type and with argument illustrating with an example.
(b) Write a program using recursion to find factorial of a given number.
(c) Create a structure student with parameters id, name and marks. Read and display the record of one student.

[TURN OVER

5. Answer any two questions from the following :— 10
- (a) Define the concept of pointers with the help of an example.
 - (b) Explain the functionality of calloc () function with syntax.
 - (c) Explain the fopen () and fclose () function with the help of example.
6. Answer any two questions from the following :— 10
- (a) Write an algorithm to search an item in a sorted linked list.
 - (b) Explain why QUEUE is known as FIFO list with an example.
 - (c) Suppose STACK is allocated N=6 memory cell and initially STACK is empty where TOP = -1. Find the output of the following module :
 - 1. Set A:=2 and B:=5
 - 2. Call PUSH(STACK,A)
Call PUSH(STACK,4)
Call PUSH(STACK,B+2)
Call PUSH(STACK,9)
Call PUSH(STACK,A+B)
 - 3. Repeat while TOP != -1
Call POP(STACK, ITEM)
Write ITEM
 - 4. Return
-

(Jan-19)

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