NARULA INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT

B TECH./CSBS/ODD/SEM 1/ PH(BS)-101/2022-2023
YEAR: 2023

# PHYSICS FOR COMPUTING SCIENCE
# PH(BS)101

TIME ALLOTTED: 3 HOURS FULL MARKS: 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable*

## GROUP – A
## (Multiple Choice Type Questions)

1. Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

| SL | Question | Marks |
|---|---|---|
| (i) | In reflected system condition of destructive interference for their parallel films is:<br>a)$2\mu t \cos r = (2n + 1)$<br>b)$2\mu t \cos r = n\lambda$<br>c)$2\mu t \sin r = n\lambda$<br>d)$2\mu t \cot r = n\lambda$ | 1 |
| (ii) | The type of pumping in Ruby laser is<br>a) optical<br>b) electrical<br>c) chemical<br>d) thermal | 1 |
| (iii) | In a current free space(J=0)<br>a)$\nabla \times B = \mu_0 J$<br>b) $\nabla \times B = 0$<br>c)$\nabla \times B = -\mu_0 J$<br>d) $\nabla \times B = \mu_0 / J$ | 1 |
| (iv) | Maxwell's third equation represents that<br>a) a changing magnetic field **B** with respect to time produces electric field **E**<br>b) a changing electric field **E** with respect to space produces magnetic field **B**<br>c) **B** is a function of t<br>d) **E** is not a function of x, y, z | 1 |
| (v) | The degree of disorderness of a system is called as<br>a) Enthalpy<br>b)entropy | 1 |

c) Temperature
d) free energy

(vi) The de Broglie wavelength of an electron in first orbit of hydrogen atom ($v = c / 137$) is 1
a) $0.32A^0$
b) $1.32A^0$
c) $2.32A^0$
d) $3.32A^0$

(vii) Sharpness of resonance is more if damping is 1
a) large
b) small
c) neither large nor small
d) none of these

(viii) If $n_1$ and $n_2$ be the refractive indices of the core and cladding respectively, then 1
a) $n_1 > n_2$
b) $n_1 < n_2$
c) $n_1 = n_2$
d) none of these

(ix) For coherence the phase difference should be 1
a) 0
b) both a and b
c) Constant
d) either a or b

(x) The expression $H\psi(r,t) = E\psi(r,t)$ is 1
a) Schrodinger equation
b) Hermitian equation
c) momentum equation
d) Correspondence principle

(xi) For coherence the phase difference should be 1
a) 0
b) both a and b
c) Constant
d) either a or b

(xii) The Miller indices of a plane having intercepts of 8a, 4b and 2c on the a, b c axes respectively will be 1
a) (112)
b) (124)
c) (234)
d) (211)





## GROUP – B
### (Short Answer Type Questions)
### (Answer any three of the following) 3 x 5 = 15

| SL | | Question | Marks |
|---|---|---|---|
| 2. | (i) | Calculate the ratio of the stimulated emission to the spontaneous emission at a temperature 400K for the sodium D line. | 3 |
| | (ii) | Obtain an expression for quality factor. | 2 |
| 3. | (i) | Calculate the kinetic energy of a neutron having de Broglie wavelength $5 \times 10^{-16}$ m. The rest mass of the neutron is $1.675 \times 10^{-27}$ Kg. | 2 |
| | (ii) | Find the packing fraction of FCC and HCP structures. | |
| 4. | (i) | Explain second law of thermodynamics. | 3 |
| | (ii) | What is carnot cycle? | 2 |
| 5. | | If $\mathbf{F} = (2xy+z^3)\mathbf{I} + x^2\mathbf{j} + 3xz^2\mathbf{k}$, show that F is an irrotational vector. | 5 |
| 6. | (i) | Light of a wavelength $2000A^0$ falls on an aluminium surface having work function 4.2eV. Find out the threshold wavelength and stopping potential. | 2 |
| | (ii) | Obtain the Packing fraction of BCC and FCC structures. | 3 |

## GROUP – C
### (Long Answer Type Questions)
### (Answer any three of the following) 3 x 15 = 45

| SL | | Question | Marks |
|---|---|---|---|
| 7 | (i) | Set up the differential equation for damped harmonic oscillator and solve it for low damping. | 5 |
| | (ii) | Obtain a relation for spacing between lattice planes. | 5 |
| | (iii) | What is double refraction? Explain the cause of double refraction. | 2+1 |
| | (iv) | A ray of light is incident on the surface of a glass plate of refractive index 1.732 at the polarizing angle. Calculate the angle of refraction of the ray. | 2 |

| | | | |
|---|---|---|---|
| 8. | (i) | Two plano-convex lenses each of radius of curvature 100cm are placed with their curved surfaces in contact with each other. Newton's rings are formed by using a light of wavelength $6 \times 10^{-5}$cm. Find the distance between $10^{th}$ and $20^{th}$ rings. | 5 |
| | (ii) | Distinguish between Fresnel and Fraunhofer class of diffraction. | 2 |
| | (iii) | Distinguish between conductor, semiconductor and insulator on the basis of band diagram. | 3 |
| | (iv) | Give the physical significance of wave function. | 2 |
| | (v) | Discuss the method of production of plane polarized and circularly polarized light. | 3 |
| 9. | (i) | Why electron can't exists in the nucleus, explain? | 3 |
| | (ii) | What is zeroth law of thermodynamics? Illustrate the concept of thermal equilibrium using it. | 2 |
| | (iii) | Discuss the construction and working of He-Ne laser. | 5 |
| | (iv) | Write down the Maxwell's equations for free space. Obtain the equation for electromagnetic wave. | 3+2 |
| 10. | (i) | Interrelate Einstein's A and B coefficients. | 5 |
| | (ii) | In Newton's rings experiment, the diameter of $5^{th}$ dark ring is 0.336cm and the diameter of the $15^{th}$ dark ring is 0.590cm. Find the wavelength of the light used if the radius of curvature of the Plano-convex lens is 100cm. | 2 |
| | (iii) | Obtain an expression for numerical aperture in case of optical fibre. | 3 |
| | (iv) | Show that for a particle executing SHM, the average kinetic energy is equal to the average potential energy and each is half of the maximum energy at any instant of time. | 5 |
| 11. | (i) | What are matter waves? | 2 |
| | (ii) | What is zeroth law of thermodynamics? Illustrate the concept of thermal equilibrium using it. | 3 |
| | (iii) | Discuss the construction and working of Ruby laser. | 5 |
| | (iv) | Write down the Maxwell's equations for free space. Obtain the equation for electromagnetic wave. | 5 |

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B TECH/ CSBS/ODD/SEM I/EE(BS)101/2022-2023
YEAR 2023

# PRINCIPLES OF ELECTRICAL ENGINEERING
## EE(BS)101

TIME ALLOTTED 3 HOURS FULL MARKS 70

*The figures in the margin indicate full marks.*
*Candidates are required to give their answers in their own words as far as practicable*

**GROUP – A**
**(Multiple Choice Type Questions)**

1. Answer any *ten* from the following, choosing the correct alternative of each question 10×1=10

(i) The B/H curve can be used to determine 1
a) Iron loss b) Hysteresis loss c) Voltage loss d) Eddy current loss

(ii) By which of the following system electrical power may be transmitted 1
a) Overhead system b) Underground system
c) both overhead and underground system d) None of these

(iii) The unit for inductance is 1
a) Ohm b) Henry c) A/m d) A/s

(iv) In a solar cell 1
a) Electrical energy is converted to light energy
b) Light energy is converted to electrical energy
c) Light energy is converted to mechanical energy
d) Electrical energy is converted to chemical energy

(v) Which of the following is the correct option in a motor context toenergy conversion? 1
a) Mechanical energy to electrical energy
b) Electrical energy to mechanical energy
c) Mechanical energy to chemical energy
d) Light energy to electrical energy

(vi) Which of the following materials is used to manufacture electrical wire? 1
a) silver b) Lead c) Copper d) Magnesium

(vii) For an ideal voltage source internal resistance is 1
a) Infinite b) 100 Ω c) 0 Ω d) 500Ω

(viii) Which of the following will happen in a transformer when the number of secondary turns is less than the number of primary turns? 1
a) The voltage gets stepped up b) The voltage gets stepped down
c) The power gets stepped up d) The power gets stepped down

(ix) Which of the following is a correct representation of peak value in an AC Circuit? 1

a) RMS value/Peak factor b) RMS value*Form factor
c) RMS value/Form factor d) RMS value*Peak factor

(x) Which of the following is correct about direct current? 1
a) Magnitude is constant
b) Frequency is zero
c) Can be transported to larger distances with less loss in power
d) Flows in one direction

(xi) How many cycles will an AC signal make in 2 seconds, if its frequency is 100 Hz? 1
a) 50 b) 100 c) 150 d) 200

(xii) Which of the following is correct about the power consumed by R1 and R2 connected in series if the value of R1 is greater than R2? 1
a) R1 will consume more power
b) R2 will consume more power
c) R1 and R2 will consume the same power
d) The relationship between the power consumed cannot be established

## GROUP – B
**(Short Answer Type Questions)**
**(Answer any three of the following) 3 x 5 = 15**

What do you mean by Real, Active and Apparent Power and their relationship with power factor? 5

Derive the emf equation of single phase transformer. 5

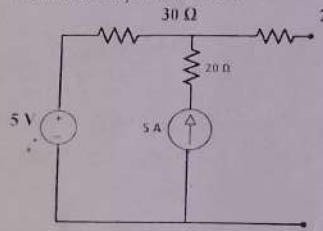
Analyze a RLC parallel circuit with its phasor representation. 5

Describe the concept of permittivity in dielectrics. 5

State and prove maximum power transfer theorem in a DC circuit. 5

## GROUP – C
**(Long Answer Type Questions)**
**(Answer any three of the following) 3 x 15 = 45**

Determine the Thevenin equivalent voltage ($V_{TH}$) and resistance ($R_{TH}$) of the following circuit across the terminal A-B. Also draw the Thevenin equivalent circuit 6

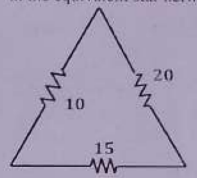






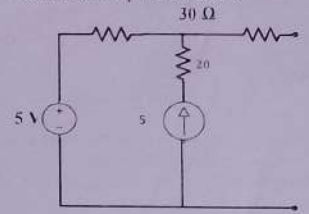

(i) A circuit consisting of a resistance and inductor connected in series. Value of resistance and inductance are 200 Ω and 638 mH respectively. If voltage V = 200 Sin (100πt) is applied across the circuit, then find the expression of current through the circuit. What is the amount of power dissipated in the circuit? 6

(ii) For the following delta network, determine resistance of each branch in the equivalent star network and draw the star equivalent circuit 7

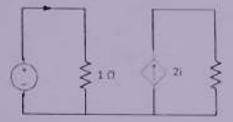



8 (i) Write down the steps to obtain Thevenin's equivalent circuit 4

(ii) Determine the Thevenin equivalent voltage ($V_{TH}$) and resistance ($R_{TH}$) of the following circuit across the terminal A-B. Also draw the Thevenin equivalent circuit 6



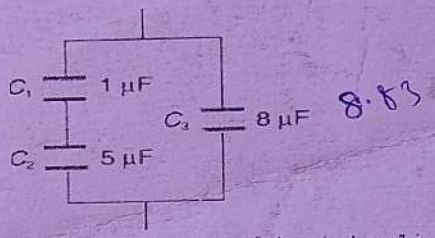

(iii) How much power will be absorbed by 2 Ω resistance in the following circuit. The source voltage is 1V. 5




9 (i) State Farady's law of electromagnetic induction 2

(ii) Describe self and mutual inductance. Write the difference between them. 6

(iii) Find the total capacitance of the combination of capacitors shown in Figure (C1 = 1.000 μF, C2 = 3.000 μF, and C3 = 8.000 μF), and round your answer to three decimal places. 7




8.83

10 (i) What are the basic types of electrical earthing? 4

(ii) Mention the major components of electrical wiring and also mention the accessories of wiring. 5

(iii) Describe the basic layout of electrical distribution system. 6

11 Write Short Notes on: (Any Three) 5*3=15

a MCCB 5

b ELCB 5

c RCCB 5

d MEGGER 5

e Resistance conversion of star and delta circuit 5

NARULA INSTITUTE OF TECHNOLOGY
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B TECH /CSBS/ODD/1ST SEM/R21/ M(BS)102/2022-2023
YEAR 2023

# INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS
## M(BS)102

TIME ALLOTTED: 3 HOURS FULL MARKS: 70

*The figures in the margin indicate full marks.*
*Candidates are required to give their answers in their own words as far as practicable*

## GROUP – A
### (Multiple Choice Type Questions)

(Answer any *ten* from the following, choosing the correct alternative of each question) 10 × 1 = 10

| | | | | | |
|---|---|---|---|---|---|
| 1. | (i) | For the random experiment of a die is thrown until 3 occurs number of sample points in the sample space is, a) 6 b) 18 c) 216 d) none of these | 1 | 2 | Understanding |
| | (ii) | If $X$ is a Poisson variate such that $P(X = 1) = P(X = 2)$, then the variance of $X$ is a) 0 b) 2 c) $\sqrt{2}$ d) $-2$ | 1 | 1 | Remembering |
| | (iii) | The expectation of the following distribution is: | 1 | 1 | Remembering |

| $x_i$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| $f_i$ | $\frac{1}{4}$ | $\frac{1}{8}$ | $\frac{1}{2}$ | $\frac{1}{8}$ |

a) $\frac{1}{2}$ b) $\frac{5}{2}$ c) 1 d) 2

| | | | | | |
|---|---|---|---|---|---|
| | (iv) | For which distribution, $\sigma = \sqrt{\mu}$? a) Binomial Distribution b) Poisson Distribution c) Uniform Distribution d) Normal Distribution | 1 | 2 | Understanding |
| | (v) | If A and B are two independent events such that $P(A + \bar{B}) = 0.8$ where $\bar{B}$ is the complementary event of B and $P(A) = 0.3$ then P(B)= a) 1/8 b) 3/8 c) 2/7 d) 2/3 | 1 | 3 | Applying |
| | (vi) | A population has normal distribution with parameter m=5 and $\sigma = 0.1$. Then $\bar{X}$, *the sample mean with sample size* 25 is a normal variable with mean and s d a) 5, 0.02 b) 5, 0.1 c) 5, 0.2 d) None of these | 1 | 4 | Analyzing |
| | (vii) | If the correlation co-efficient between $x$ and $y$ is 0.5, then the correlation co-efficient between $5x$ and $3y$ would be a) 0.5 b) −0.5 c) 1.5 d) −1.5 | 1 | 5 | Evaluating |
| | (viii) | Find the mode of 12, 13, 11, 15, 11, 12, 11 a) 11 b) 12 c) 13 d) 15 | 1 | 1 | Remembering |

(ix) The variance of a random variable X is — 1 5 Evaluating
a) $E(X)-E(X^2)$ b) $(E(X))^2-E(X^2)$
c) $E(X^2)-E(X)$ d) $E(X^2)-(E(X))^2$

(x) In a non-leap year the probability of getting 53 Sundays is — 1 3 Applying
a) 1/7 b) 2/7 c) 3/7 d) 4/7

(xi) The arithmetic mean of a set of 10 numbers is 20. If each number is first multiplied by 2 and then increased by 5, then what is the mean of new numbers? — 1 1 Remembering
a) 20 b) 25 c) 40 d) 45

(xii) Let X be a random variable with the following probability mass function — 1 2 Understanding

| X | -3 | 6 | 9 |
|---|---|---|---|
| P(X=x) | 1/6 | 1/2 | 1/3 |

Find E(X)
a) 93/2 b) 11/2 c) 65/4 d) 65

## GROUP – B
### (Short Answer Type Questions)
(Answer any three of the following) 3 x 5 = 15

2 Is the following a p.d.f. of any probability distribution ? — 5 4 Analyzing

$$f(x)=\begin{cases}2x & 0<x\le 1\\ 4-2x & 1<x\le 2\\ 0 & elsewhere\end{cases}$$

3 The average life of a certain type of motor is 10 years, with a standard deviation of 2 years. If the manufacturer is willing to replace only 3% of the motors because of failures, how long a guarantee should she offer — 5 3 Applying

4 The mean and standard deviation of marks of 70 students were found to be 65 and 5.2 respectively. Later it was found that the mark of one student was wrongly recorded as 85 instead of 58. Obtain the correct s.d — 5 5 Evaluating

5 The median and mode of the following marks are known to be 33.5 and 34 respectively. However three frequencies are missing. Determine their values — 5 5 Evaluating

| Marks | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | Total |
|---|---|---|---|---|---|---|---|---|
| No. of students | 4 | 16 | ? | ? | ? | 6 | 4 | 230 |

6 In a screw manufacturing factory, the probability that a screw is defective is known to be 0.02. If 100 screw are taken for inspection, then find the probability that (i) there is no defective screw, (ii) at most 3 defective screws and (iii) — 5 2 Understanding





exactly 5 defective screws

## GROUP – C
### (Long Answer Type Questions)
(Answer any three of the following) 3 x 15 = 45

7 (i) A shipment of 8 similar microcomputers to a retail outlet contains 3 that are defective. If a school makes a random purchase of 2 of these computers, find the probability distribution of the number of defectives — 7 4 Analyzing

(ii) A random variable X has p.d.f. given by — 4+4 3 Applying
f(x)= 1/10 ,0 < x < 10
0, elsewhere
Find (i) P(X>8|X>5) (ii) P(X>7|X<9)

8 (i) Find the mean and standard deviation of the following grouped frequency distribution — 8 5 Evaluating

| Class | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90-99 |
|---|---|---|---|---|---|---|---|
| Frequency | 2 | 12 | 22 | 20 | 14 | 4 | 1 |

(ii) The following data give the ages and blood pressure of 10 women. — 2+3+2 1 Remembering

| Age (X) | 56 | 42 | 36 | 47 | 49 | 42 | 60 | 72 | 63 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|
| Blood Pressure(Y) | 147 | 125 | 118 | 128 | 145 | 140 | 158 | 150 | 140 | 152 |

i. Find the correlation coefficient between X and Y
ii. Determine the regression equation of Y on X.
iii Estimate the blood pressure of a women whose age is 45 years

9 (i) Given the population of elements {22, 24, 26} — 4+4+2 2 Understanding
i) Write down all possible samples of size two, chosen by simple random sampling.
ii) Calculate the variance of the population
iii) Calculate the variance of the sample averages.

(ii) A population has mean μ= 8 and standard deviation σ = 3. If a random sample of size n= 36 is selected, then what is the probability that the sample mean is between 7.8 and 8.2? — 5 4 Analyzing

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10. | (i) | From the following data, obtain the two regression equations. | | | | | | | | | | 8 | 3 | Applying |

| Sales | 91 | 97 | 108 | 121 | 67 | 124 | 51 | 73 | 111 | 57 |
|---|---|---|---|---|---|---|---|---|---|---|
| Purchases | 71 | 75 | 69 | 97 | 70 | 91 | 39 | 61 | 80 | 47 |

Hence estimate the purchase when sale will be 100.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (ii) | Samples of certain size are drawn from a normally distributed population with S.D 16. It is observed that the probability of the sample mean lying in between 9.8and 14.6 is 45.14% Find the sample size and the population mean. Given that $\int_{-\infty}^{0.8} \phi(z)dz = 0.7257$ | | | | | | | | | | 7 | 5 | Evaluating |
| 11. | (i) | A source of liquid contains bacteria with the average number of bacteria per c.c. equal to 3. Ten 1 c.c. test tubes are filled with the liquid. Calculate (i) that all 10 test tubes show growth, that is contains at least 1 bacterium each (ii) that exactly 7 test tubes show growth. [Given $e^{-3} = 0.0\div975$] | | | | | | | | | | 7 | 1 | Remembering |
| | (ii) | A random variable X has the following p.m.f | | | | | | | | | | 2+2+2+2 | 4 | Analyzing |

| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| P(X=x) | k | 3k | 5k | 7k | 9k | 11k | 13k |

a) Find the value of k.
b) Find P(X<4), P(3<X≤5)
c) Obtain the distribution function of X
d) What is the smallest value of x for which $P(X \le x) > 0.5$?

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B.TECH/CSBS/ODD/SEM-1/R_21/M(BS)101/2022-2023
YEAR: 2023

# DISCRETE MATHEMATICS
# M(BS)101

TIME ALLOTTED: 3 HOURS FULL MARKS: 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable*

## GROUP – A
## (Multiple Choice Type Questions)

1. Answer any *ten* from the following, choosing the correct alternative of each question. **10×1=10**

| SL | Question | Marks | Co | Blooms Taxonomy Level |
|---|---|---|---|---|
| (i) | A simple graph has<br>(a) no parallel edges<br>(b) no loops<br>(c) no parallel edges and no loops<br>(d) none | 1 | 1 | Remember |
| (ii) | A group is abelian iff<br>(a)ab=ba<br>(b)ab=ab<br>(c)ba=ba<br>(d)none | 1 | 1 | Remember |
| (iii) | The only generators of the cyclic group (Z, +) is<br>(a) 1<br>(b) 0, 1<br>(c) 1, -1<br>(d) All positive integers | 1 | 1 | Remember |
| (iv) | The number of edges in a complete graph with n vertices is<br>(a) $n$<br>(b) $n(n+1)/2$<br>(c) $n(n-1)/2$<br>(d) $n/2$ | 1 | 1 | Remember |
| (v) | An edge whose two end vertices coincide is called<br>(a) ring<br>(b) loop<br>(c) adjacent edge<br>(d) none | 1 | 1 | Remember |
| (vi) | The degree of an isolated vertex is<br>(a) 0<br>(b) 1<br>(c) 2 | 1 | 1 | Understand |

| | | | | |
|---|---|---|---|---|
| | (d) none | | | |
| (vii) | If a graph has 5 vertices and 7 edges then the size of the adjacency matrix is<br>(a) 5 × 5<br>(b) 5 × 7<br>(c) 7 × 5<br>(d) 7 × 7. | 1 | 2 | Understand |
| (viii) | A self-loop cannot be included in a<br>(a) Walk<br>(b) Path<br>(c) Trail<br>(d) None | 1 | 2 | Understand |
| (ix) | The proposition p∧(~pvq) is<br>(a) Tautology<br>(b) Logical equivalence to p∧q<br>(c) Logical equivalence to pvq<br>(d)Contradiction | 1 | 2 | Understand |
| (x) | $(p \rightarrow \sim q) \rightarrow p$ is a contradiction<br>(a) True<br>(b) False | 1 | 2 | Understand |
| (xi) | A semi group (G, *) will be monoid if<br>(a) * Is associative<br>(b) * is commutative<br>(c) G contains inverse of every element<br>(d) G contains identity element | 1 | 1 | Remember |
| (xii) | Which of the following statement is a proposition?<br>a) Get me a glass of milkshake<br>b) God bless you!<br>c) What is the time now?<br>d) The only odd prime number is 2 | 1 | 2 | Understand |

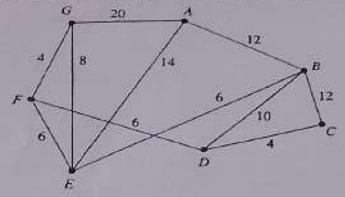
## GROUP – B
### (Short Answer Type Questions)
### (Answer any three of the following) 3 x 5 = 15

| SL. | | Question | Marks | Co | Blooms Taxonomy Level |
|---|---|---|---|---|---|
| 2. | (i) | Show that a group is (G, o) abelian if and only if $(a \circ b)^2 = a^2 \circ b^2$, ∀ a, b∈ G | 3 | 3 | Apply |
| | (ii) | Let G be a group and H, K are subgroups of G .Then H∩K is a subgroup of G. | 2 | 3 | Explain |
| 3. | | Show that ((p∨q)∧~(~p∧(~q∨~r)))∨(~p∧~q)∨(~p∧~r) is a tautology | 5 | 1 | Remember |
| 4. | | Show that the number of edges in a simple graph having "n" vertices cannot exceed $n(n-1)/2$ edges. | 5 | 2 | Understand |





| | | | | |
|---|---|---|---|---|
| 5. | Represent the argument:<br>If it rains today, then we will not meet today.<br>If we do not meet today, then we will meet tomorrow.<br>---<br>If it rains today, then we will meet tomorrow.<br>Symbolically and find whether the argument is valid | 5 | 4 | Apply |
| 6. | State the rules of Prim's Algorithm. Obtain minimal spanning tree of the following graph using Prim's algorithm: | 5 | 4 | Apply |

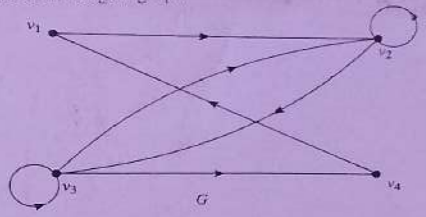
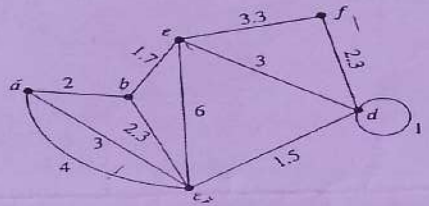
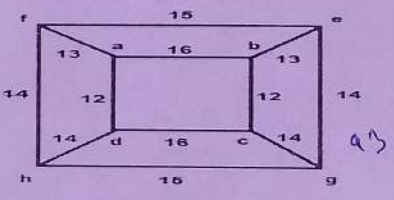



## GROUP – C
### (Long Answer Type Questions)
### (Answer any three of the following) 3 x 15 = 45

| SL. | | Question | Marks | Co | Blooms Taxonomy Level |
|---|---|---|---|---|---|
| 7. | (i) | Solve the recurrence relation<br>$a_{n+2} = 4a_{n+1} - 4a_n \; for \; n \geq 0 \; and \; a_0 = 1 \; and a_1 = 3$ | 8 | 1 | Evaluate |
| | (ii) | Define regular graph. Draw the graph for the following incidence matrix | 7 | 4 | Evaluate and explain |

$$\begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \\ v_6 \end{array} \begin{array}{c} \begin{array}{cccccccc} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 & e_7 & e_8 \end{array} \\ \begin{bmatrix} 0 & 0 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

| | | | | | |
|---|---|---|---|---|---|
| 8. | (i) | Prove that every group of prime order is cyclic | 5 | 3 | Apply |
| | (ii) | Define three basic logic gates along with their truth table and diagrams. | 6 | 1 | Explain |
| | (iii) | Draw the logic circuit with the following inputs A, B, C to express the following<br>a. Y=AB'+B'C<br>b=Y=AB'+A'C | 2+2 | 2 | Understand |

| | | | | | |
|---|---|---|---|---|---|
| 9. | (ii) | Among 100 students, 32 study mathematics, 20 study physics, 45 study chemistry, 7 study mathematics and physics, 15 study mathematics and chemistry, 10 study physics and chemistry, 30 do not study any of the three subjects. Determine the number of students studying exactly one of the three subjects. | 5 | 1 | Evaluate |
| | (iii) | Define complete graph. Construct the adjacency matrix for the following di-graph   | 6 | 4 | Evaluate and explain |
| | (iii) | Find the minimum number of students needed to guarantee that 5 of them belong to same class (1st year, 2nd year, 3rd year and 4th year) | 4 | 1 | Apply |
| 10. | (i) | Find the PDNF and PCNF of $(\sim p \rightarrow r) \wedge (p \rightarrow q)$ using truth table | 7 | 2 | Evaluate |
| | (iii) | Apply Dijktra's algorithm to find the out shortest path of the following graph ($a$ to $f$):   | 8 | 4 | Apply |
| 11. | (i) | State Kruskal's algorithm and apply it to compute the minimal spanning tree for following graph   | 6 | 2 | Understand and apply |
| | (ii) | Using generating function solve the recurrence relation: $a_n = 7a_{n-1}+10a_{n-2}=2$ for all n>1 with $a_0=a_1=3$ | 9 | 1 | Evaluate |

NARULA INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT

B TECH/CSBS/ODD/SEM I/R 21/ HU(BS)101/2022-2023
YEAR 2023

# BUSINESS COMMUNICATION AND VALUE SCIENCE - I
# HU(BS)101

TIME ALLOTTED: 3 HOURS FULL MARKS: 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable*

## GROUP – A
## (Multiple Choice Type Questions)

1. Answer any *ten* from the following, choosing the correct alternative of each question: 10×1=10

| Sl. | Question | Marks | Co |
|---|---|---|---|
| (i) | Communication barriers are<br>A. a receiver's response to a message<br>B. avenues through which messages are delivered<br>C. obstacles that interfere with the understanding of a message<br>D. the circumstances under which communication takes place | 1 | C2.6.12 |
| (ii) | Communication is a ___ way process-<br>A. One B. Two C. Three D. None | 1 | C2.6.1 |
| (iii) | One word for making something better-<br>A. Amiable B. Ameliorate. C. Motivate D. Reform | 1 | C2.6.9 |
| (iv) | Antonym for "nemesis" is<br>A. Foe B. Ally C. Appreciate D. None of these | 1 | C2.6.9 |
| (v) | Contents of self exploration are<br>A. Desire and Needs B. Program and needs<br>C. Program and practical. D. Desire and program | 1 | C2.6.12 |
| (vi) | The content of value education is expected to include _____dimensions and levels of a human being<br>A. Two B. All C. Three D.Four | 1 | C2.6.2 |
| (vii) | What is the meaning of the given idiom- " A piece ofcake"<br>A. An easy task B. Doing something in advance<br>C. Eating a lot D. Beautiful person | 1 | C2.6.9 |
| (viii) | Five basic guidelines for value, education are Universal,Natural and verifable, all encompassing, leading to harmony and _____<br>A. Self-exploration B. Education<br>C. Right Utilization D. Rational | 1 | C2.6.12 |
| (ix) | Which of the following formal communication is written after the meeting?<br>A. Notice and agenda B. Memo | 1 | C2.6.13 |

C. MOM and report D. Circular

(x) Communication involves- 1 C2.6.1
A. Agreement B. Consensus
C. Conviction D. Understanding

(xi) This is an example of non verbal communication 1 C2.6.12
A. Science B. History C. Economics D. Geography

(xii) This is an example of non verbal communication 1 C2.6.11
A. Science B. History C. Economics D. Geography

**GROUP – B**
**(Short Answer Type Questions)**
**(Answer any three of the following) 3 x 5 = 15**

| SL | Question | Marks | Co |
|---|---|---|---|
| 2 | **Read the following passage carefully.** | 5 | C2.6.9 |

The name of Florence Nightingale lives in the memory of the world by virtue of the heroic adventure of the Crimea. Had she died - as she nearly did - upon her return to England, her reputation would hardly have been different, her legend would have come down to us almost as we know it today - that gentle vision of female virtue which first took shape before the adoring 5 eyes of the sick soldiers at Scutari. Yet, in fact, she lived for more than half a century after the Crimean War, and during the greater part of that long period all the energy and all the devotion of her extraordinary nature were working at their highest pitch. What she accomplished in those years of unknown labor could, indeed, hardly have been more glorious than her Crimean triumphs, but it was certainly more important. The true history was far stranger 10 even than the myth. In Miss Nightingale's own eyes, the adventure of the Crimea was a mere incident – scarcely more than a useful stepping- stone in her career. It was the fulcrum with which she hoped to move the world, but it was only the fulcrum. For more than a generation she was to sit in secret, working her lever: and her real life began at the very moment when, in popular imagination, it had ended. She arrived in England in a shattered state of health. The hardships and the ceaseless efforts of the last two years had undermined her nervous system; her heart was affected; she suffered constantly from fainting-fits and terrible attacks of utter physical prostration. The doctors declared that one thing alone would save her – a complete and prolonged rest. But that was also the one thing with which she would have nothing to do. She had never been in the habit of resting; why should she begin now? Now, when her opportunity had come at last; now, when the iron was hot, and it was time to strike? No, she had work to do; and, come what might, she would do it. The doctors protested in vain, in vain, her family lamented and entreated, in vain her friends pointed out to her the madness of such a course. Madness? Mad - possessed - perhaps she was. Frenzy had seized upon her. As she lay upon her sofa, gasping, she devoured blue books, dictated letters, and, in the





intervals of her palpitations, cracked jokes. For months at a stretch she never left her bed. But she would not rest. At this rate, the doctors assured her, even if she did not die, she would become an invalid for life. She could not help that, there was work to be done; and, as for rest, very likely she might rest when she had done it.

Wherever she went, to London or in the country, in the hills of Derbyshire, or among the rhododendrons at Embley, she was haunted by a ghost. It was the specter of Scutari - the hideous vision of the organization of a military hospital. She would lay that phantom, or she would perish. The whole system of the Army Medical Department, the education of the Medical Officer, the regulations of hospital procedure – rest? How could she rest while these things were as they were, while, if the like necessity were to arise again, the like results would Follow? And, even in peace and at home, what was the sanitary condition of the Army? The mortality in the barracks, was, she found, nearly double the mortality in civil life. "You might as well take 1, 100 men every year out upon Salisbury Plain and shoot them," she said.

After inspecting the hospitals at Chatham, she smiled grimly "Yes, this is one more symptom of the system which, in the Crimea, put to death 16,000 men."; Scutari had given her knowledge, and it had given her power too: her enormous reputation was at her back - an incalculable force. Other work, other duties, might lie before her; but the most urgent, the most obvious, of all was to look to the health of the Army.

1. According to the author, the work done during the last fifty years of Florence Nightingale's life was, when compared with her work in the Crimea, all of the following except
A. less dramatic
B. less demanding
C. less well-known to the public
D. more important
E. more rewarding to Miss Nightingale herself

2. The "fulcrum" (line 11) refers to her
A. reputation
B. mental energy
C. physical energy
D. overseas contacts
E. commitment to a cause

3. Paragraph two paints a picture of a woman who is
A. an incapacitated invalid
B. mentally shattered
C. stubborn and querulous
D. physically weak but mentally indomitable
E. purposeful yet tiresome

4. The primary purpose of paragraph 3 is to
A. account for conditions in the army

B. Miss Nightingale questioning her own conscience
C. Miss Nightingale's response to an actual questioner
D. Responses to the doctors who advised rest
E. The author's device to highlight the reactions to Miss Nightingale's plans

5. The author's attitude to his material is
A. disinterested reporting of biographical details
B. over-inflation of a reputation
C. debunking a myth
D. uncritical presentation of facts
E. interpretation as well as narration

| | | | |
|---|---|---|---|
| 3 | Write a precise on the summary of the above passage in not more than 100 words | 5 | C2.6.8 |
| 4 | Complete the following sentences using appropriate prepositions.<br>1. I have this pen _____ two more red pens.<br>2. The thief jumped_____ the wall.<br>3. The man was murdered ___ the thief ____ a dagger.<br>4. They climbed _____ the highest hill they could find.<br>5. Pick _____ your favorite jacket. | 5 | C2.6.13 |
| 5 | Write a short note Stress Management. | 5 | C2.6.13 |
| 6 | Describe the relationship between prosperity and happiness. | 5 | C2.6.12 |

## GROUP - C
**(Long Answer Type Questions)**
**(Answer any three of the following) 3 x 15 = 45**

| SL | | Question | Marks | Co |
|---|---|---|---|---|
| 7 | (i) | Discuss the process of Communication cycle. | 5 | C2.6.13 |
| | (ii) | You have purchased a new cellphone on 15 th Decemer,2022 Today while working with it in the morning you found that the keypad is not functioning properly.Write a letter to the customer care of Zen India ltd(1/1 LDL Road,New Delhi) mentioning the problem. | 10 | C2.6.4 |
| 8 | (i) | What is the importance of presentation skills? | 5 | C2.6.3<br>C2.6.5 |
| | (ii) | Discuss five dos and five don'ts of presentation. Elaborate each point. | 10 | C2.6.6 |
| 9 | | What is a barrier in the process of Communication? Describe the different types of barriers with examples. | 15 | C2.6.14 |
| 10 | | What do you understand by value crisis in society? What is 'good life'? Describe the value spectrum. | 15 | C2.6.12 |
| 11 | | State the purpose and process of self-exploration. | 15 | C2.6.15 |

NARULA INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT

BTECH/CSBS/ODD/Sem-1/CB101/ R_21/2022-2023
YEAR: 2023

# FUNDAMENTALS OF COMPUTER SCIENCE
# CB101

TIME ALLOTTED: 3 HOURS | FULL MARKS: 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable*

## GROUP – A
## (Multiple Choice Type Questions)

1. Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

| SL | Question | Marks | Co | Blooms Taxonomy Level |
|---|---|---|---|---|
| (i) | 8's complement of $(78.22)_8$ is-<br>a) -15.22<br>b) -14.23<br>c) 21.78<br>d) cannot be determined | 1 | 1 | 3 |
| (ii) | Maximum positive number in decimal that can be represented using 8 bits in signed 2's complement System is-<br>a) 127<br>b) 128<br>c) 255<br>d) 256 | 1 | 1 | 2 |
| (iii) | If a variable is a pointer to a structure, then which of the following operator is used to access data members of the structure through the pointer variable?<br>a) .<br>b) &<br>c) *<br>d) -> | 1 | 3 | 1 |
| (iv) | What is the default return type of main() function in C programming?<br>a) float<br>b) void<br>c) int<br>d) none | 1 | 3 | 1 |
| (v) | What is default storage class of variables in C language?<br>a) global<br>b) extern<br>c) local<br>d) auto | 1 | 3 | 1 |
| (vi) | The declaration float *a[5]; is | 1 | 3 | 2 |

a) a normal pointer
b) an ordinary array
c) an array of pointer
d) a pointer to an array

(vii) Which of the following is not a keyword in C Programming Language? — 1 | 1 | 1
a) auto
b) signed
c) integer
d) register

(viii) char str[20]="Hello,World!"; — 1 | 3 | 2
How many bytes are allocated by the above declaration?
a) 11
b) 12
c) 20
d) 21

(ix) Which of the following operator(s) in C Programming Language can be considered as unary operator? — 1 | 1 | 1
a) +
b) -
c) ~
d) All of the above

(x) 9's complement of $(77.85)_{10}$ is- — 1 | 1 | 3
a) 21.15
b) 22.14
c) 9922.14
d) cannot be determined

(xi) $(1217)_8$ is equivalent to — 1 | 1 | 3
a) $(1217)_{16}$
b) $(028F)_{16}$
c) $(2297)_{10}$
d) $(0B17)_{16}$

(xii) Which of the following is a bitwise operator? — 1 | 1 | 1
a) <
b) <<
c) >=
d) &&

## GROUP – B
## (Short Answer Type Questions)
**(Answer any three of the following) 3 x 5 = 15**

| SL. | Question | Marks | Co | Blooms Taxonomy Level |
|---|---|---|---|---|
| 2. | Define a macro to find the smallest number between 2 given numbers. Use it in main function to print the smallest number among 4 given numbers. | 5 | 3 | 4 |







| | | | | | |
|---|---|---|---|---|---|
| 3. | (i) | What are the difference between structure and union? | 2 | 3 | 2 |
| | (ii) | Consider a union having one integer, one float and one char member. What will be the total size? | 1 | 3 | 4 |
| | (iii) | Write a C function to print the member of the above union, which is currently stored. | 2 | 3 | 4 |
| 4. | (i) | What is the return type of malloc function? | 1 | 4 | 1 |
| | (ii) | Write a c program to add the diagonal elements of a 2D square array. | 4 | 3,4 | 3 |
| 5. | | Write a C function, inrdcr(), which will increment and decrement two integers passed as arguments by 1.<br>Also write the main function and call inrdcr() from main, print the results in main function only.<br>Do not use any global variables.<br>Note:<br>Design the prototype of inrdcr() as per requirement. | 5 | 3,5 | 4 |
| 6. | (i) | What is unary operator in C? Give two examples of unary operators in C. | 1+1 | 1 | 1 |
| | (ii) | Evaluate the following expression (value of X). Show all the steps.<br>X= - ~ 11 | 3 | 1 | 3 |

## GROUP – C
## (Long Answer Type Questions)
**(Answer any three of the following) 3 x 15 = 45**

| SL. | | Question | Marks | Co | Blooms Taxonomy Level |
|---|---|---|---|---|---|
| 7. | (i) | Given an unsorted array A of size N of non-negative integers, find a continuous sub-array which adds to the given number (taken as input). Print the starting and end index of the sub-array if exists, otherwise print -1. | 10 | 2,3 | 4 |
| | (ii) | Write a C program to check whether a number taken as input is prime or not. | 5 | 2 | 4 |
| 8. | (i) | What is storage class in C? | 2 | 3 | 1 |
| | (ii) | What is scope and lifetime of a variable define in C? Explain with example. | 2+3 | 3 | 1 |
| | (iii) | Consider the following C program. It will print 'Exit' regardless the value we give as input. Now we want this recursive rec function to redefine in such a way that it will return to its calling function (main) an integer equal to number of times the rec function [int rec(int n)] has called itself that is the value we give as input. Accept this return value in main function and print. Rewrite both the function that is rec and main functions. | 8 | 2,3 | 4 |

#include <stdio.h>

```
void rec(int n)
{
  if(n==0)
    printf("Exit\n");
  else
    rec(n-1);
}
int main()
{
  int n;
  printf("Enter a positive integer\n");
  scanf("%d",&n);
  rec(n);
  return 0;
}
```

Niven nur

871 = 9

81/9 =

Ans

$1^3$ ! = ____

| | | | | | |
|---|---|---|---|---|---|
| 9. | (i) | Define Actual Parameter and Formal Parameter. Differentiate between actual parameters and formal parameters with example. | 2+2+2 | 3,5 | 2 |
| | (ii) | Can actual parameters and formal parameters have same name? | 1 | 3,5 | 2 |
| | (iii) | Write a C program to print the second largest element from a list of integers stored in an array. You cannot change the location of any elements nor scan the array more than once. | 8 | 2,3 | 4 |
| 10. | (i) | Distinguish between i++ and ++i with suitable examples. Comment on the datatype of i? | 2+3 | 1 | 2 |
| | (ii) | Write a C program to check whether a given string is a sub-string of another string or not. Both the strings are input from user. | 10 | 3 | 4 |
| 11. | (i) | How can we detect overflow in signed 2's complement system? Explain with suitable examples. How can it be detected? | 8 | 1 | 2 |
| | (ii) | What is preprocessor directive? Why it is called preprocessor? | 1+1 | 3,5 | 1 |
| | (iii) | What is the difference between compiler and interpreter? | 3 | 3 | 2 |
| | (iv) | What is the difference between extern storage class and global variables in C? | 2 | 3 | 2 |