# JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/( CSE/IT)/ BS-M201A / 2021-22
2022
## MATHEMATICS - IIA

Times: 3 Hours

Full Marks: 70

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

### GROUP-A
### [OBJECTIVE TYPE QUESTIONS]

5x2=10

Answer ***all*** questions

1. If A and B are independent events, then show that $\bar{A}$ and $\bar{B}$ are also independent events. 2
2. Show that Variance (X) = E($X^2$) – $(E(X))^2$. 2
3. A die is thrown 10 times in succession. Find the probability of obtaining six at least once. 2
4. A random variable X has the following probability distribution:

| X=x | -3 | -2 | -1 | 0 | 1 | 2 |
|---|---|---|---|---|---|---|
| P(X=x) | k | 2k | $2k^2$ | $3k^2$ | $k^2$ | $6k^2$+8k |

Determine the value of k. 2
Also evaluate P(X<1).
5. If X is normally distributed with mean 0 and variance 1. Find $E(X^2)$. 2

### GROUP-B
### [LONG ANSWER TYPE QUESTIONS]

12x5 = 60

Answer any ***five*** questions

6. i) The chance that a doctor will diagnose a certain disease correctly is 60%. The chance that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of the doctor who had the disease dies. What is the probability that the disease was diagnosed correctly? 6
   ii) Two persons agree to play a game by drawing balls by turn from a box containing 4 white and 6 black balls. He who draws the first white ball wins. Find the probability that the man who starts the game loses the game. 6
7. i) The probability of a man hitting a target is $\frac{1}{4}$. How many times he should fire so that the probability of his hitting the target at least once is greater than $\frac{2}{3}$. 6
   ii) Determine the value of C such that $f(x)$ defined by $f(x) = \begin{cases} Cx(1-x), 0 < x < 1 \\ 0, elsewhere \end{cases}$ is a probability density function. Find the corresponding distribution function and P(X>$\frac{1}{2}$). 6
8. i) A point P is chosen at random on a line segment AB of length 2a. Find the expected value of AP.PB 3
   ii) If there is a war every 15 years on the avarage, then find the probability that there will be no war in 25 years. 3
   iii) Show that correlation coefficient lies between -1 and 1. 4
9. i) The joint pmf of (X,Y) is given by 7

| | X | 1 | 2 |
|---|---|---|---|
| Y | | | |
| 0 | | 0.27 | 0.41 |
| 1 | | 0.11 | 0.21 |

Find (a) E(X) (b) E(Y) (c) E($X^2$) (d) E($Y^2$) (e) E(X,Y) (f) Cov(X,Y) (g) Correlation (X,Y)

   ii) The first three moments of X about 3 are 2, 10 and 30 respectively. Obtain the first three moments about 0. Hence find the variance of X. 5

10. i) Find mean and variance of Binomial (n, p) distribution. 3+3

ii) From the following data, obtain the two regression equations: 6

| 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. To get a purchase of 60 what is the required sales?

11. i) The data below show the lengths (y) in cm. attained by a coiled spring corresponding to various weight (x) in gm. Fit a straight line of the form $y = ax + b$. Hence predict the length of a coil spring when an weight of 698 gm is loaded. 6

| X (gm) | 100 | 200 | 300 | 400 | 500 | 600 |
|---|---|---|---|---|---|---|
| Y (cm) | 90.2 | 92.3 | 94.2 | 96.3 | 98.2 | 100.3 |

ii) Find the variance and standard deviation of the following frequency distribution: 6

| Weight (in Kg) | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65 | 66-70 |
|---|---|---|---|---|---|---|---|
| No. of persons | 14 | 26 | 40 | 33 | 50 | 37 | 25 |

12. i) Marks obtained by 10 students in Physics and Mathematics are given in the following table 6

| Marks in Phy | 48 | 33 | 40 | 9 | 16 | 16 | 65 | 24 | 16 | 57 |
|---|---|---|---|---|---|---|---|---|---|---|
| Marks in Math | 13 | 13 | 24 | 6 | 15 | 4 | 20 | 9 | 6 | 19 |

Find the rank correlation coefficient of the two series of marks.

ii) If the equation of two regression lines obtained in a correlation analysis are 3x+12y=19 and 3y+9x=46, determine which one of these is regression equation of x on y. Find means and correlation coefficient. 2+2+2

13. i) Following the frequency distribution of a variable x: 7

| X | 112.45 | 117.45 | 122.45 | 127.45 | 132.45 | 137.45 | 142.45 |
|---|---|---|---|---|---|---|---|
| f | 5 | 15 | 20 | 35 | 10 | 10 | 5 |

Find its coefficient of skewness.

ii) The weight of students in a college is normally distributed with m=40kg and $\sigma = 5$ kg. Find the percentage of the students that have weight (a) greater than 40kg (b) greater than 50kg (c) between 38 kg and 52 kg. [Given that $\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{2} e^{-\frac{t^2}{2}}dt = 0.9772$, $\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{.4} e^{-\frac{t^2}{2}}dt = 0.6554$ and $\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{2.4} e^{-\frac{t^2}{2}}dt = 0.9918$]. 5

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Jalpaiguri Government Engineering College, Jalpaiguri
Department of Computer Science & Engineering
Principle of Problem Solving (ESCS-201) 12th May' 2022
Class Test - I, Full Marks - 15, Time - 45 min, Even Semester

1. (a) You are given two floating points number A and B. Give a strategy for performing the ADDITION operation on the two numbers for the following two case. No need to write any program. **[2+2 = 4]**

Case-I: The two numbers have same exponent (e) and sign (s) but different mantissa (m).

Case-II: The two numbers have different exponents (e) signs (s) mantissa (m).

(b) *Numerologists* map large numbers to a single digit number between 1 to 9 in order to tell future. For example, given a number 8734, they reduce it as follows 8+7+3+4 = 22, 2 + 2 = 4, so the number 8734 reduces to 4. Write a program in C program, which takes a number as input and reduces it to a single digit number between 1 to 9. (Note that only the number 0 can reduce to 0 and we assume that the input will always be non-zeros. )? **[4]**

(c) The character arrays[] are used to store strings or sequence of characters which ends with '\0' and we know that array name itself is a pointer. Is their any difference between these two declaration **char amessage[] = "now is the exam"** and **char * pmessage = "now is the exam"**. If "yes" what are those differences? **[2]**

(d) What will be the output of the following programs?. **[2 + 2 = 4]**

(i).
```
#include<stdio.h>
int main()
{
    int arr[3] = {2, 3, 4};
    char *p;
    p = arr;
    p = (char*)((int*)(p));
    printf("%d", *p);
    p = (int*)(p+1);
    printf("%d", *p);
    return 0;
}
```

(ii).
```
#include<stdio.h>
int main()
{
    int a=5;
    int x;
    x= ~a + a & a + a << a;
    printf("%d ",x);
    getchar();
    return 0;
}
```

(e) Which of the following three functions are not likely to cause problems with the pointer? Justify your answer. **[1]**

(i).
```
int* jgec(void)
{
    int x = 10;
    return(&x);
}
```

(ii).
```
int* jgec(void)
{
    int* ptr;
    *ptr = 10;
    return ptr;
}
```

(iii).
```
int* jgec(void)
{
    int* ptr;
    ptr = (int*)malloc(sizeof(int));
    *ptr = 10;
    return ptr;
}
```

# JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
COE/B.TECH./CSE/ECE/IT/BS-PH201/2021-22
2022
PHYSICS

Full Marks: 70

Times: 3 Hours

*The figures in the margin indicate full marks.*
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## GROUP-A
## [OBJECTIVE TYPE QUESTIONS]

Answer *all* questions. 5x2=10

1. Prove that the dipole moment of N point charges of a neutral charge system is independent of the choice of the origin of the coordinate system. 2
2. Write down the time independent Schrodinger equation (TISE) for a particle mass $m$, energy $E$ confined in a region of potential barrier $V$. 2
3. Find the unit normal to the surface $x^2y + y^2z + z^2x = 4$ at a point $(1, -1, 1)$. 2
4. Starting form Gauss's law in electrostatic show that $\vec{\nabla}.\vec{D} = \rho$. 2
5. "X-ray is widely used to analyze the structure of different type crystal". Explain. 2

## GROUP-B
## [LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions. 4x15=60

6. i) State and derive Malus' Law. 3
   ii) A left circularly polarized beam ($\lambda = 589.3$ nm) is incident on a quartz crystal (with its optic axis cut parallel to the surface) of thickness 0.025 mm. Determine the state of polarization of the emergent beam. Assume $n_o$ and $n_e$ to be 1.54425 and 1.55336 respectively. 4
   iii) Show that if an unpolarized beam is incident at an angle $\theta_p = \tan^{-1}(\frac{n_2}{n_1})$, then the reflected beam will be linearly polarized with its electric vector perpendicular to the plane of incidence. 5
   iv) Comment on the state of polarization of the electric field given by: $\vec{E} = E_0 \cos(kz - \omega t)\,\hat{\imath} + E_0 \cos(kz - \omega t + \pi/2)\,\hat{\jmath}$. 3

7. i) Write down 4-Maxwell's equation (EM-Theory) in free space. Show that both the **E** and **B** field propagate with speed c in free space. 6
   ii) Define Poyinting vector. The electric field of a plane electromagnetic wave propagating in free space is given by: $\vec{E} = E_0 \cos(kx - \omega t)\hat{j}$. Determine the corresponding magnetic field and the time average Poynting vector for the wave. 6
   iii) Parallel beam of light ($\lambda = 589.3\,nm$) is passing though a narrow slit of dimension **0.005 mm**. How many minima are observed in either side of the principal maxima? 3

8. i) Obtain an expression for the heat produced in a dielectric material subjected to an alternating voltage. What is loss-tangent? 5
   ii) A charge $q$ is elastically bound through a spring constant $K$ N/m. What is the polarizability of the system? 3
   iii) Obtain the relationship between polarization $\vec{P}$ and electric field $\vec{E}$. How they are related to electric displacement vector $\vec{D}$? Hence define dielectric constant of the medium. 5
   iv) $+q, -q, +2q$ and $-2q$ point charges are fixed at $(0,0)$, $(1,0)$, $(1,1)$, and $(0,1)$. What will be the **dipole moment** corresponding to this charge configuration? 2

9. i) Show that $\left(1+\frac{d}{dx}\right)^2 = 1 + 2\frac{d}{dx} + \frac{d^2}{dx^2}$. 2

ii) Consider a particle of mass m confined in a one-dimensional infinite potential well 6

$$V(x) = \begin{cases} 0 & for\ 0 < x < L \\ \infty & otherwise \end{cases}$$

Suppose that the particle is in the stationary state $\varphi_n = \sqrt{\frac{2}{L}} \sin\left(\frac{n\pi x}{L}\right)$ of energy $E_n = \frac{\pi^2 \hbar n^2}{2mL^2}$.

Calculate $< x >$ and $< p >$. Explain the result briefly.

iii) Prove that $[\hat{x}_k, \hat{p}_l] = i\hbar\delta_{kl}$. 3

iv) Show that $\frac{2}{L}\int_o^{2\pi} \sin\left(\frac{m\pi x}{L}\right) \sin\left(\frac{n\pi x}{L}\right) dx = \delta_{mn}$ 4

10. A vertical spring having constant $272\ N/m$ has a $16\ kg$ weight suspended from it. An external force given as a function of time $t$ by $F(t) = 240\ sin4t, t \geq 0$ is applied. A damping force given numerically in newtons by $32v$, where $v$ is the instantaneous speed of the object in $m/s$, is assumed to act. Initially the weight is at rest at the equilibrium position.

i) Set up the **differential equation** describing the motion. 3

ii) Find the **position** of the weight at any time. 4

iii) Indicate the **transient** and **steady-state** solutions, giving physical interpretations of each. 5

iv) Find the **amplitude**, **period** and **frequency** of the steady-state solution. (Use $g = 10m/s^2$) 3

11. i) Show that $\vec{F} = (2xy + z^3)\hat{\imath} + x^2\hat{\jmath} + 3xz^2\hat{k}$ is a conservative force field. Find the potential. Find the **work done** in moving an object in this field from *(1,-2,1)* to *(3,1,4)*. 5

ii) Show that $\frac{\Delta E}{E}$, the fractional change in photon energy in the Compton Effect equals $\left(\frac{h\nu}{m_o c^2}\right)(1 - cos\theta)$. Plot $\frac{\Delta E}{E}$ versus $\theta$. 4

iii) The stopping potential for photoelectrons emitted from a surface illuminated by light of wavelength **492 nm** is **0.71 V**. When the incident wavelength is changed the stopping potential is found to be **1.43 V**. What is the **new wavelength**? 3

iv) An atom can radiate at any time after it is excited. It is found that in a typical case the average excited atom has a life-time of about **0.1 ns**. That is, during this period it emits a photon and is deexcited.) What is the **minimum uncertainty** in the frequency of the photon? 3

12. i) A parallel plate capacitor of area **A** and separation **d** is filled with a dielectric material (**K**). The capacitor is connected with a DC power supply of voltage $V_c$. Calculate the **amount of energy spent** to polarize the dielectric material. 5

ii) The electric field in a region is given as $\vec{E} = kr^3\hat{r}$. Prove that charge contained within a spherical surface of radius a centered at the origin is $4\pi\epsilon_o ka^5$. 5

iii) A number n of SHMs, all in the same straight line and having the same amplitude and frequency, but with a constant phase difference, are superposed. Calculate the amplitude of the resultant SHM. 5

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# JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH./CSE/ECE/IT/ES-CS201/2021-22

2022

## PROGRAMMING FOR PROBLEM SOLVING

Full Marks: 70 Times: 3 Hours

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

### GROUP-A
### [OBJECTIVE TYPE QUESTIONS]

5x2=10

Answer ***all*** questions

1. Convert $(41819)_{10} = (?)_{16}$
2. What is type casting?
3. Which one is the right output?
```
char name[ ]= "Computer Science";
    printf("%d",strlen(name));
```
***a)*** 19 ***b)*** 20 ***c)*** 21 ***d)*** none of these
4. 
```
#define JGEC(x) (x*20)
void main( )
{
   int a=3, b;
   b= JGEC(a + 2);
   printf("\n%d",b);
}
```
What will be the output?
***a)*** 101 ***b)*** 5 ***c)*** 25 ***d)*** none of these
5. Which operator can be used to access Union data members if the Union data is accessed using union to pointer variable?

### GROUP-B
### [LONG ANSWER TYPE QUESTIONS]

4x15=60

Answer any ***four*** questions

6. i) Write down the difference between Entry controlled loop and Exit controlled loop with suitable example.
   ii) Write down the advantages and disadvantages of "switch" over "if-else"?
   iii) Distinguish between i++ and ++i with suitable example.
   iv) Let a 2 D array is declared asint a[2][3];What is the total memory size allocated by this array and maximum how many elements canbe stored in this array?If the base address is 2000, compute the address of a[1][2]. [Size of an integer variable 2 bytes].

   4 + 3+ 3+5

7. i) Write a C program to sort a 1-D array in descending order using bubble sort technique.
   ii) What is macro? What is the difference between macro and C function?
   iii) Write a C program to check whether a string is palindrome or not without using string header file.

   5+(2+3)+5

8. i) i) Write a C program to print the sum of the following series:
   $S = 1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \cdots$ up to $N^{th}$ term.
   ii) Write down the difference between array of character and string? Explain with suitable example the mechanism of structure pointer.
   iii) Write a C program to transpose a 2D matrix and display the resultant matrix.

   6+(1+3)+5

PTO

9. i) Write a complete C program to print the Fibonacci series up to $n^{th}$ term?
ii) Write a C program to search an element from a given array using binary search technique. All the inputs should be taken from user.
Explain call by value and call by reference with example.

5+5+5

10. i) Define a structure called cricket that will describe
player name,
team name,
batting average
age
Using cricket, declare an array player with 50 elements and write a program to read the information about all the 50 players and display them
ii) Calculate the total required memory of the structure cricket that you have created.
iii) Differentiate between structure and union.
iv) What is self-referential structure? Give an example of unary operator.

7+2+3+3

11. i) Write a program to calculate and display the truth table of all the unique Boolean functions of two variables.
ii) Write a C program to print the following pattern

5 4 5 4 5
4 5 4 5
5 4 5
4 5
5

iii) What are auto, external and static variables? Explain their uses with suitable examples.

5+5+5

12. i) What is pointer? What do you mean by pointer arithmetic?
ii) Write a C program to interchange two integer numbers using call by reference.
iii) Write an user friendly C program to create a link list by inserting the elements from the beginning.
What is the difference between malloc and calloc?

(2+3)+5+3+2

**END**

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
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JGEC/B.TECH/CE/EE/ME/CSE/ECE/IT/HM-HU201/2022-23
2022
ENGLISH

**Full Marks: 70** **Time Allotted: 3 Hours**

*The figures in the margin full marks. Candidates are required to give their answer in their own wards as per as practicable.*

## Group – A
## [OBJECTIVE TYPE QUESTIONS]

**Answer *all* questions:** **5x2=10**

Explain the meaning of the expressions highlighted below:

1. She is thought to be **a chip of the old block.**
2. He's been **in the doldrums** ever since his wife deserted him.
3. I'm safe; I hope Sam is **out of woods** too.
4. When you called him a coward, you **hit the nail on the head.**
5. I advised her not to **live in an ivory tower.**

## Group – B
## [LONG ANSWER TYPE QUESTIONS]

**Answer any *four* questions:** **4x15=60**

6. a) Write an essay on the factors affecting the preference of engineering course among students. (200 words) **10**

b) Fill in the blanks with appropriate prepositions: **5**
i) You can look _____ words in the dictionary.
ii) Our plane took _____ thirty minutes late.
iii) Will the old man live _____ the day?
iv) I'm sorry he disobeyed instructions I'll take him _____ when he gets back.
v) Someone's been rifling _____ my drawers, some important papers are missing.

7. a) You are a recent post graduate in science and interested in research, apply for the post of Junior Research Associate in the R&D division. You should hold a post-graduate degree in Mathematics, Physics, Chemistry or Biology. Apply within 15 days to Manager Research, R&D Division, Wipro Industries, Bangalore-560012. **10**

b) Give one word expressions for the following: **5**
i) Important printed government communication/news:
ii) One who runs own business:
iii) Study of human skin:

iv) One who behaves differently from others with his own opinions:
v) Scientific study of mind:

8. a) As the Purchase Officer of a Company, write a complaint letter to Uniflex Limited, New Delhi, pointing out the damage which was discovered after checking a consignment containing Compact Discs sent to you by the supplier. Invent necessary details. **10**

b) Fill in the blanks with appropriate antonym of the word given in the bracket: **5**
i) His _____ (legal) business is _____ (sinking).
ii) The _____(last) thing that struck me when I met him was his _____ (artificial) sorrow.
iii) By the time we _____(began) our work, it was already_____(evening).
iv) He was an intellectual _____(dwarf) with a_____(strong) constitution.
v) _____(surely) I rose and responded. My speech was followed by a thunderous _____(criticism).

9. a) Write a memo to the accounting department asking them to attend training to learn about the new software the company has adopted. Invent necessary details. **10**

b) Form sentences to point out the difference in meaning between words of each set: **5**
i) groan/grown, ii)descent/dissent, iii)dense/dents, iv)ceiling/sealing, v)feat/fit

10. a)Write an email to a colleague congratulating him on his success in a grand project. **10**

b) Do as directed: **5**
i) The teacher scolded him for coming late. (Begin: He…)
ii) It was so hot that the PT period could not be held. (Begin It was too…)
iii) Our school sent up the best exhibit to the Town Hall. (Rewrite using 'better')
iv)They were asked to combine all their ideas into one document. (Rewrite using 'combination')
v) As soon as the bell rang, the children ran out. (Begin: No sooner…)

11. a) Write an essay on the topic 'peer pressure'. (250 words) **10**

b) Fill in the blanks with the appropriate form of the verb given in the bracket: **5**
I ___(i)__ (pull) up into the driveway ___(ii)__ (observe) the way they had __(iii)___ (build) up the balcony. I __(iv)___ (forget) that the bricks of the house ___(v)__ (be) chocolate brown.

_____