

2022

MATHEMATICS — GENERAL

Paper : GE/CC-4

Full Marks : 65

*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

1. Choose the correct answer :

1×10

(a) Which of the following set is a group with respect to addition

- (i) $\{-3, -2, -1, 0, 1, 2, 3\}$ (ii) $\{-1, 1\}$
 (iii) $\{-1, 0, 1\}$ (iv) $\{0\}$.

(b) -2 is an eigenvalue of the matrix $M = \begin{pmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix}$. Then M^{-1} has an eigenvalue

- (i) -2 (ii) 1
 (iii) 2 (iv) $-\frac{1}{2}$

(c) Probability that **at least one** of the events A and B occurs is

- (i) $P(A) + P(B) - P(AB)$ (ii) $P(A) + P(B) + 2P(AB)$
 (iii) $P(A) + P(B) + P(AB)$ (iv) $P(A) + P(B) - 2P(AB)$

(d) Number of divisor of zero in the Ring $(\mathbb{Z}_5, \oplus, \odot)$ is

- (i) 0 (ii) 1
 (iii) 2 (iv) 3

(e) If $(0, 1, 3) = a(2, 1, 1) + b(4, 2, 2)$, then the values of a and b are

- (i) $(1, 1)$ (ii) $(-1, 1)$
 (iii) $(0, 0)$ (iv) None of these.

Please Turn Over

- (d) Find the eigenvalues and eigenvectors of the matrix $\begin{pmatrix} 1 & -1 & 2 \\ 2 & -2 & 4 \\ 3 & -3 & 6 \end{pmatrix}$.
- (e) Show that the real quadratic form $5x^2 + y^2 + 14z^2 - 4yz - 10zx$ is positive definite.

Unit-2**(Computer Science and Programming)**

3. Answer **any four** questions :

- (a) Find the product of $(11.0011)_2$ and $(10.01)_2$ and also find the octal and hexadecimal equivalents of the product. 5
- (b) Draw a flowchart for computing the g.c.d. of two positive integers m and n . 5
- (c) (i) Let $A = 2.7$, $B = 3.5$ and $L = \text{ABS}(A - 3.*B)/5$. Find what will be stored at L .
- (ii) Write FORTRAN expression of $\frac{\sqrt{a + \log_e b}}{c + d \sin x}$ 2+3
- (d) Write an algorithm to sort n given integers in descending order. 5
- (e) Write a FORTRAN program to find the area of a triangle whose three sides are given. 5
- (f) What is positional number system? Why are binary numbers used in computer design? 2+3
- (g) Write a FORTRAN program to check whether a year is a Leap year or not. 5

Unit-3**(Probability and Statistics)**

4. Answer **any four** questions :

- (a) Bag A contains 2 white and 3 red balls; and bag B contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from bag B . 5×4
- (b) Four persons are chosen at random from a group containing 3 men, 2 women and 4 children. Show that the chances that exactly two of them will be children is $\frac{10}{21}$.
- (c) Find the coefficient of correlation from the following data :

x	0	1	2	3	4
f	2	3	5	10	5

(d) Draw a Histogram from the following distribution :

Age Group	14-15	16-17	18-20	21-24	25-29	30-34	35-39
No. of wage earners	60	140	150	110	110	100	90

Please Turn Over

- (e) The population of scores of 10 years children in a test is known to have a standard deviation 5.2. If a random sample of size 20 shows a mean of 16.9, find 95% confidence interval for the mean score of the population, assuming that the population is normal.

$$\left(\text{Given that } \frac{1}{\sqrt{2\pi}} \int_{1.96}^{\infty} e^{-\frac{x^2}{2}} dx = 0.025 \right).$$

- (f) If the equations of two regression lines obtained in a correlation analysis are $2y + x = 11$ and $2x + 3y - 18 = 0$, determine which one of them is the regression equation of x on y . Find the means and correlation coefficient of x and y .
- (g) In a random sample of size 400 there are 80 defective items. Test at 5% level whether the proportion of defective items in the population may be regarded as $\frac{1}{6}$.

$$\left[\text{Given } \int_0^{1.96} \phi(t) dt = 0.475, \phi \text{ is the pdf of normal variate} \right].$$
