

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 : 5×4

(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  $B$ .

(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  $\frac{1}{6}$ .

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

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