

2019

Time : 3 hours

Full Marks : 80

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

The questions are of equal value.

*Answer **five** questions in which*

Q. No. 1 is compulsory.

1. **Choose the correct answer from the given alternatives :**

   (a) Which one of the following is true ?

   (i) Natural number 2 is composite number

   (ii) All real numbers are complex numbers but all complex number are not real number

   (iii) All complex number are natural number

   (iv) None of these

(b) $\lim_{n\to\infty}\frac{(3n+1)(n-3)}{n(n+3)} = ?$

(i) 1 (ii) 2

(iii) 3 (iv) None of these

(c) The argument of the complex number $z = 1 - i$ is :

(i) $\frac{\pi}{4}$ (ii) $\frac{5\pi}{4}$

(iii) $\frac{7\pi}{4}$ (iv) None of these

(d) The value of ${}^{n}c_1 + {}^{n}c_2 = ?$

(i) ${}^{n}c_2$ (ii) ${}^{n+1}c_1$

(iii) ${}^{n+1}c_2$ (iv) None of these

(e) The coefficient of the middle term in the expansion of $\left(2x+\frac{1}{3x}\right)^6$ is :

(i) 15 (ii) 35

(iii) 20 (iv) None of these

(f) The value of $(11000101)_2$ is :

(i) $(132)_8$ (ii) $(145)_8$

(iii) 98 (iv) None of these

(g) In the word 'binary', 'bi' means :

(i) 1 (ii) 2

(iii) 3 (iv) 4

(h) Octal number system uses symbols :

(i) 7 (ii) 8

(iii) 9 (iv) 10

2. (a) Find the solution set of the inequality $3 - 2x \geq x - 32$, if $x \in N$.

(b) Find the value of r if $5.\ {}^{4}P_r = 6.\ {}^{5}P_{r-1}$.

3. (a) Convert into polar form of complex number $\frac{1+7i}{(2-i)^2}$.

(b) How many odd numbers less than 1000 can be formed using the digits 0, 1, 4, 5, 7, 8 if the repetition of digits is allowed ?

4. (a) Find the value of $\left(a^2+\sqrt{a^2-1}\right)^4 + \left(a^2-\sqrt{a^2-1}\right)^4$.

(b) If the first term of a G. P. is 5 and the sum of first three terms is $\frac{31}{5}$, find the common ratio.

6. (a) If a, b and c be respective sums of p, q and r terms of an A.P, show that $\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$.

(b) Solve, $\sin 2x - \sin 4x + \sin 6x = 0$.

6. (a) Evaluate $\lim_{x \to a} \frac{x^m - a^m}{x^n - a^n}$.

(b) Find the derivatives of $\cos(2x + 3)$ from first principle.

7. (a) Find the sum, substraction and multiplication of the following :

(i) 0011010 + 001100

(ii) 0011010 – 001100

(iii) 0011010 × 001100

(b) Convert the following binary numbers to hexadecimal :

(i) $(10100101111)_2$

(ii) $(101001)_2$

8. Draw the logic circuit diagram with truth table :

(a) $f = \bar{A}\bar{B}\bar{C} + \bar{A}BC + A\bar{B}C + AB\bar{C}$

(b) $f = \overline{(a+b+c)}.\overline{(a+b+c)}$

9. Explain the number system and discuss the types of number system with suitable two examples.