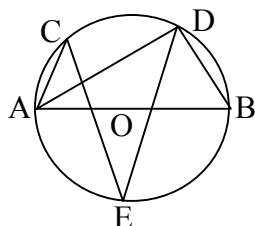


**DEFENCE SERVICES TECHNOLOGICAL ACADEMY  
ENTRANCE EXAMINATION**

**MATHEMATICS**

**Time Allowed :(2)Hours**

1. Choose the correct or the most appropriate answers for each question. Write only the letter of the answer. (30 Marks)
- (1) Given that  $f: R \rightarrow R$  is defined by  $f(x) = 2 + \frac{3}{x}$ , then  $f^{-1}(5)$ 
    - A. -1 B. -2 C. 0 D. 1 E. 5
  - (2) An operation  $e$  on  $R$  is defined by  $xey = 3x(x + 3y)$  for all real numbers  $x$  and  $y$ , if  $ae1 = 30$ , then positive value of  $a =$ 
    - A. -2 B. -5 C. 0 D. 2 E. 5
  - (3) If  $f(x) = 3x - 1$ , then  $f(2) + (f \cdot f)(2) =$ 
    - A. 11 B. 13 C. 15 D. 17 E. 19
  - (4) Given  $n$  is an integer, the remainder when  $x^{2n} - 4x + 7$  is divided by  $(x + 1)$  is
    - A. 14 B. 12 C. 10 D. -14 E. -12
  - (5) If  $x - 2$  is a factor of  $x^n + 9x^2 - 68$ , then  $n =$ 
    - A. 3 B. 4 C. 1 D. 2 E. 5
  - (6) If  $x^2 - 1$  is a factor of  $x^3 + 2x^2 + bx + a$ , then  $b =$ 
    - A. 1 B. 2 C. 3 D. -1 E. -2
  - (7) The coefficient of the middle term in the expansion of  $(x^2 + \frac{2}{x})^6$  is
    - A. -120 B. 125 C. 240 D. -240 E. 160
  - (8) In the expansion of  $(3 + kx)^9$ , the coefficients of  $x^3$  and  $x^4$  are equal. Then  $k =$ 
    - A. 1 B. 2 C. 3 D. -1 E. -2
  - (9) The coefficient of  $xy^4$  in the expansion of  $(x - 2y)^5$  is
    - A. 80 B. 40 C. -10 D. -32 E. -80
  - (10) The solution set in  $R$  for the inequation  $2x^2 - 8x + 8 \leq 0$  is
    - A. {4} B. {2} C.  $\phi$  D.  $\{x/-3 \leq x \leq 3\}$  E.  $R$
  - (11) The solution set in  $R$  for the inequation  $x^2 + 4 < 0$  is
    - A.  $R$  B. {2} C.  $\{x/-2 \leq x < 2\}$  D.  $\phi$  E. non of these
  - (12) The solution set in  $R$  of  $(x - 3)^2 \geq 0$  is
    - A.  $R$  B.  $R \setminus \{3\}$  C.  $\phi$  D.  $\{x/x \geq 3\}$  E.  $\{x/x \leq 3\}$
  - (13) Given that  $3, x, y, z, 23, \dots$  is an arithmetic sequence, then  $z =$ 
    - A. 13 B. 18 C. 21 D. 22 E. non of these
  - (14) Given that  $7, a, b, c, -5$  in an A.P, then the mean of  $a, b, c$  is
    - A. -2 B. 1 C.  $\frac{3}{2}$  D. 3 E. 4
  - (15) If  $P = \begin{bmatrix} 1 + 2x \\ 10 \end{bmatrix}$ ,  $Q = \begin{bmatrix} 2 \\ 1 - y \end{bmatrix}$  and  $P + 2Q = \begin{bmatrix} 3 \\ 2y \end{bmatrix}$ , then  $\frac{y}{x} =$ 
    - A. 3 B. 2 C. -3 D. -2 E. -4
  - (16)  $A = \begin{bmatrix} 2 & 0 \\ 1 & 5 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 0 \\ 2 & k \end{bmatrix}$ . Then value of  $k$  for which  $AB = BA$  is
    - A. -1 B. 1 C. 7 D. -4 E. 4
  - (17) If  $P(\text{not}A) = nP(A)$ , then  $P(A) =$ 
    - A.  $n$  B.  $n+1$  C.  $\frac{1}{n}$  D.  $\frac{1}{n+1}$  E.  $n^2$
  - (18) A coin is tossed 3 times and a die is rolled once. The number of possible outcome is
    - A. 6 B. 8 C. 12 D. 24 E. 48
  - (19) If a die is rolled 90 times, the expected frequency of a number divisible by 3 is
    - A. 30 B. 45 C. 60 D. 15 E. non of these
  - (20) In the figure,  $AB$  is diameter of the circle  $O$ ,  $\angle ACE = x$ ,  $\angle BDE =$ 
    - A.  $(180^\circ - 2x)$  B.  $2x$  C.  $(180^\circ - x)$  D.  $(90^\circ - x)$  E.  $x$



- (21) The angle in the semicircle is  
A.  $30^\circ$  B.  $60^\circ$  C.  $360^\circ$  D.  $90^\circ$  E.  $180^\circ$
- (22) If the ratio of areas of two similar triangles is 16:225, then the ratio of the lengths of corresponding angle bisectors is  
A. 16:25 B. 4:15 C. 25:4 D. 6:25 E. 13:25
- (23) The areas of two similar triangles are in the ratio 4:9. One side of the smaller triangle is 4. The corresponding side of the other triangle is  
A. 2 B. 3 C. 4 D. 5 E. 6
- (24) If  $\vec{a}, \vec{b}$  are non-parallel and non-zero such that  $(3x + y)\vec{a} + (y - 3)\vec{b} = \vec{0}$ , then  $x =$   
A. 1 B. -1 C. 3 D. -3 E. non of these
- (25) ABCD is a parallelogram. Then  $\vec{AC} + \vec{BD} =$   
A.  $\vec{AB}$  B.  $2\vec{AB}$  C.  $\vec{BC}$  D.  $2\vec{BC}$  E.  $\vec{BA}$
- (26)  $\tan(-135^\circ) + \cot 315^\circ =$   
A. 1 B. 2 C. -1 D. 0 E. non of these
- (27)  $\sec(-45^\circ) \times \sin(-45^\circ) =$   
A. 0 B. 1 C. -1 D. 2 E. -2
- (28) The equation of the tangent to the curve  $y = e^x - ex$  at the point (1,0) is  
A.  $x=0$  B.  $x=1$  C.  $y=0$  D.  $y=1$  E.  $x=3$
- (29) The curve  $y = \ln x - x$  has the maximum turning point is  
A. (0,0) B. (1,1) C. (1,0) D. (1,-1) e. (0,1)
- (30) The rate of change of the function  $f(x) = \cos x^3$  is  
A.  $-3\sin x^3$  B.  $3x\cos x^3$  C.  $-3x\sin x^3$  D.  $-3x^2\sin x^3$  E.  $-x\sin x^3$

2. The function  $f$  and  $g$  are defined by  $f(x) = 3x - 1$  and  $g(x) = \frac{3x+2}{x-1}, x \neq 1$ . Find the inverse functions  $f^{-1}$  and  $g^{-1}$ . Evaluate  $(g \circ f^{-1})(5)$  and  $(f \circ g^{-1})(2)$ .  
(10 Marks)

3. The polynomial  $px^3 + qx^2 - 5x - 6$  is exactly divisible by  $2x^2 + x - 6$ . Calculate the values of  $p$  and  $q$ , and factorize the polynomial completely.  
(10 Marks)

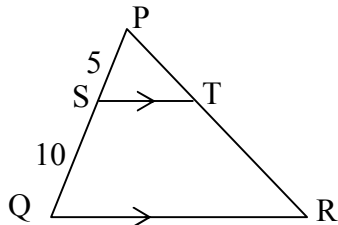
4.(a) Find the solution set in  $\mathbb{R}$  of the inequation  $(2 - x)^2 - 16 \geq 0$  and illustrates it on the number line.  
(5 Marks)

(b) Find the solution set in  $\mathbb{R}$  of the inequation  $4(2x - 3)^2 \geq x^2$  and illustrate it on the number line.  
(5 Marks)

5. The sum of the first four terms of A.P is 38. The sum of their square is 406. Find the third term and fourth term.  
(10 Marks)

6. A box contain 5 marbles, 3 are blue, 1 white and 1 red. Two marbles are drawn one after another without replacement. Draw a tree diagram to describe the possible outcomes. Find the probabilities of at least one blue marble, exactly one blue marble and at most one blue marble.  
(10 Marks)

7. In  $\Delta PQR$ , S and T are the points on the sides PQ and PR respectively, and  $ST \parallel QR$ . If  $PS=5$ ,  $SQ=10$  and  $\alpha(\text{SQRT})=104$ , find  $\alpha(\Delta PQR)$ .  
(10 Marks)



8. What is the smallest perimeter possible for a rectangle of area  $16 \text{ ft}^2$ .  
(10 Marks)