

# 2021 March 18 Shift 1

EE24BTECH11005 - Arjun Pavanje

16) If the functions are defined as  $f(x) = \sqrt{x}$  and  $g(x) = \sqrt{1-x}$ , then what is the common domain of the following functions:

$$f + g, f - g, \frac{f}{g}, \frac{g}{f}, g - f \text{ where } (f \pm g)(x) = f(x) \pm g(x), \left(\frac{f}{g}\right) = \frac{f(x)}{g(x)}$$

- a)  $0 \leq x \leq 1$   
b)  $0 \leq x < 1$   
c)  $0 < x < 1$   
d)  $0 < x \leq 1$

17) If

$$f(x) = \begin{cases} \frac{1}{|x|} & ; |x| \geq 1 \\ ax^2 + b & ; |x| < 1 \end{cases}$$

is differentiable at every point of the domain, then the values of  $a$  and  $b$  are respectively

- a)  $\frac{1}{2}, \frac{1}{2}$   
b)  $\frac{1}{2}, = \frac{3}{2}$   
c)  $\frac{5}{2}, -\frac{3}{2}$   
d)  $-\frac{1}{2}, \frac{3}{2}$

18) The sum of all the 4-digit distinct numbers that can be formed with the digits 1, 2, 2, 3 is,

- a) 26664                      b) 122664  
c) 122234                  d) 22264

19) Let ,

$$A + 2B = \begin{pmatrix} 1 & 2 & 0 \\ 6 & -3 & 3 \\ -5 & 3 & 1 \end{pmatrix}$$
$$2A - B = \begin{pmatrix} 2 & -1 & 5 \\ 2 & -1 & 6 \\ 0 & 1 & 2 \end{pmatrix}$$

If  $tr(A)$  denotes the sum of all diagonal entries of the matrix  $A$ , then  $tr(A) - tr(B)$  is,

a) 0

b) 1

c) 2

d) 3

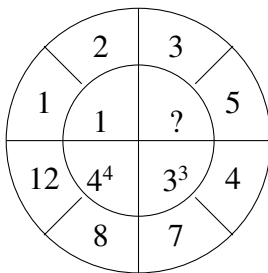
20) The value of

$$3 + \frac{1}{4 + \frac{1}{3 + \frac{1}{4 + \frac{1}{3 + \dots}}}}$$

is equal to,

a)  $1.5 + \sqrt{3}$ b)  $2 + \sqrt{3}$ c)  $3 + 2\sqrt{3}$ d)  $4 + \sqrt{3}$ 

- 21) The number of times digit 3 will be written when listing the integers from 1 to 1000 is \_\_\_\_\_
- 22) The equation of the planes parallel to the plane  $x - 2y + 2z - 3 = 0$  which are at unit distance from the point  $(1, 2, 3)$  is  $ax + by + cz + d = 0$ . If  $(b - d) = k(c - a)$ , then the positive value of  $k$  is \_\_\_\_\_
- 23) Let  $f(x), g(x)$  be two functions satisfying  $f(x^2) + g(4 - x) = 4x^3$  and  $g(4 - x) + g(x) = 0$ , then the value of  $\int_{-4}^4 f(x^2) dx$  is, \_\_\_\_\_
- 24) The mean age of 25 teachers in a school is 40 years. A teacher retires at the age of 60 years and a new teacher is appointed in his place. If the mean age of the teachers in this school now is 39 years, then the age of the newly appointed teacher is \_\_\_\_\_
- 25) A square  $ABCD$  has all its vertices on the curve  $x^2y^2 = 1$ . The midpoints of its sides also lie on the same curve. Then, the square of the area of  $ABCD$  is \_\_\_\_\_
- 26) The missing value in the following figure is, \_\_\_\_\_



- 27) The number of solutions of the equation  $|\cot x| = \cot x + \left(\frac{1}{\sin x}\right)$  in the interval  $[0, 2\pi]$  is \_\_\_\_\_
- 28) Let  $z_1, z_2$  be the roots of the equations  $z_2 + a_z + 12 = 0$  and  $z_1, z_2$  form an equilateral triangle with origin. Then, the value of  $|a|$  is \_\_\_\_\_

- 29) Let the plane  $ax + by + cz + d = 0$  bisect the line joining the points  $\begin{pmatrix} 4 \\ -3 \\ 1 \end{pmatrix}, \begin{pmatrix} 2 \\ 3 \\ -5 \end{pmatrix}$  at right angles. If  $a, b, c, d$  are integers, then the minimum value of  $(a^2 + b^2 + c^2 + d^2)$  is, \_\_\_\_\_
- 30) If  $f(x) = \int \frac{[5x^8 + x^6]}{[x^2 + 1 + 2x^7]^2} dx, (x \geq 0), f(0) = 0$  and  $f(1) = \frac{1}{k}$ , then the value of  $k$  is, \_\_\_\_\_