

COMPETITIVE ENTRANCE

2014 SESSION

Department: Civil Engineering and Forestry Techniques, Electrical and Power Engineering, Mechanical Engineering and Computer Science
1st Cycle Option: ALL

Paper 2: Mathematics

Duration 3 hours

- If $\left| \frac{2x+5}{x-1} \right| < 1$, then the set of values of x that satisfies it is:
A) $-3 < x < 4$ B) $-18 < x < -4$ C) $-6 < x < \frac{4}{3}$ D) $x < \frac{4}{3}$ and $x < -6$
- The value of x if $32^x = 0.25$ is
A) $\frac{2}{3}$ B) $\frac{5}{2}$ C) $\frac{2}{5}$ D) 4
- $f(x) \equiv x^3 - 2x^2 - 11x + 52$ is exactly divisible by:
A) $x - 5$ B) $x + 4$ C) $5x - 6$ D) $x - 2$
- If $\left(\frac{x}{(x-4)(x-1)} \right) \equiv \frac{a}{3(x-4)} - \frac{1}{3(x-1)}$ then a is:
A) 1 B) -1 C) 4 D) -4
- If $\frac{x^3}{(x+1)(x-3)} = px + p + \frac{1}{4(x+1)} + \frac{27}{4(x-3)}$ then p and q are respectively:
A) 1, 2 B) 2, 1 C) -2, 1 D) 1, -2
- $x = 3 - \tan\theta$, $y = 3\cos\theta$ in terms of x and y only:
A) $y^2 = \frac{9}{x^2-6x+10}$ B) $y^2 = \frac{9}{x^2+6x+10}$ C) $y = \frac{9}{x^2-6x-10}$ D) $y = \frac{9}{x^2-6x+10}$
- The point $(-1, 2)$ on the curve $x = t$, $y = t^3 - 3t$ and is:
A) Minimum point B) maximum point C) point of inflexion D) none of these.
Questions 8 and 9 are answer using the data on question 8
- A particle of mass m kg falls from rest under gravity in a medium which the resistance is of magnitude $\frac{mgv^4}{c^4}$ where v is the speed of the particle and c is a constant. The time the particle takes to attain a speed of $\frac{c}{2} \text{ ms}^{-1}$ is:
A) $t = \frac{c}{2g} \left[\ln 3 + 2 \tan^{-1} \left(\frac{1}{2} \right) \right]$ B) $t = \frac{c}{2g} \left[\ln 2 + 3 \tan^{-1} \left(\frac{1}{2} \right) \right]$
C) $t = \frac{c}{8g} \left[\ln 3 + 2 \tan^{-1} \left(\frac{1}{2} \right) \right]$ D) $t = \frac{c}{4g} \left[\ln 3 + 2 \tan^{-1} \left(\frac{1}{2} \right) \right]$
- If $g = 10$ and $c = 2$, the time for the speed $\frac{c}{2} \text{ ms}^{-1}$ to be obtained will now be:
A) 5.48 B) 8.08 C) 1.48 D) 2.78
- $\int_0^{-2} \frac{1}{1-x} dx$ is A) not possible B) $-\ln 3$ C) $\ln 3$ D) $-\frac{1}{2} \ln 3$
- $\int_0^1 \frac{1}{1+a^2x^2} dx = \frac{\pi}{4}$ Then the value of a is: A) 1 B) -1 C) $\frac{\pi}{4}$ D) $-\frac{\pi}{4}$
- $\int \sin^4\theta d(\sin\theta)$ is the same as integrating wrt θ is:
A) $\sin^4\theta \cos\theta d\theta$ B) $\sin^5\theta \cos\theta$ C) $\sin^3\theta \cos\theta$ D) none of the above
- The eight term of a GP is 256 and the first term is 2, its common ratio is
A) 7 B) 2 C) 128 D) 128
- A group of 2 boys and 3 girls is to be chosen from 5 boys and 4 girls. If one girl refuses to serve in the same committee as one particular boy, the number of possible groups are:
A) 40 B) 12 C) 10 D) 28
- Which of the following is not an equation of a circle?
A) $x^2 + y^2 - x = 0$ B) $x^2 + 2y^2 + x - 2y = 0$
C) $3x^2 + 3y^2 = 1$ D) $x^2 + y^2 - 6x - 8y = 2$
- When two circles with centers C_1 and C_2 and radii r_1 and r_2 respectively touch externally C_1C_2 is
A) $r_1^2 + r_2^2$ B) $r_1 + r_2$ C) $|r_1 - r_2|$ D) r_1r_2

17. If z is any cube root of unity, the value of $z^2 + z$ is
A) 1 B) 0 C) -1 D) 2
18. The sum to infinity of a GP is 5 times its first term. The common ratio is:
A) 1 B) $1/5$ C) -4 D) $4/5$
19. The Cartesian equation of the curve defined parametrically by $x = 2\sin\theta, y = \cos^2\theta$ is:
A) $4y + x^2 - 4 = 0$ B) $y + 4x^2 - 4 = 0$ C) $4y^2 + x^2 - 4 = 0$ D) $y^2 + x^2 = 0$
20. The probability function of a discrete random variable X is given by:
 $f(x) = K(3x + 1), x = 0, 1, 2, 3$.
The value of K is: A) $1/11$ B) $1/22$ C) $1/44$ D) $1/24$
21. $E(X)$ is: A) $24/11$ B) $44/22$ C) $43/22$ D) $41/22$
22. What is the exact value of the logarithm of 8 to base 64?
A) 2 B) $1/2$ C) 6 D) 8
23. Expressing $1 + \log_{10} 3$ as a single logarithm gives:
A) $\log_{10} 30$ B) $\log_{10} 3$ C) $\log_{10} 4$ D) $\log_{10} \left(\frac{3}{10}\right)$
24. An AP has 12 terms. If its 5th term is 7 and its common difference is 6, then the sum of the AP is:
A) 300 B) 396 C) 192 D) 196
25. The limits of $\frac{x^3 - 3x^2 + 3}{x - 1}$ at 1 is: A) 0 B) 12 C) -3 D) 3

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