

## COMPETITIVE ENTRANCE

2014

## SESSION

Department: Civil Engineering and Forestry Techniques, Electrical and  
Power Engineering, Mechanical Engineering and Computer Science

1<sup>st</sup> Cycle

Option: ALL

Paper 2: Mathematics

Duration 3hours

- 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)  $\frac{4}{3}$
- $f(x) \equiv x^3 - 2x^2 - 11x + 52$  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)  $t = \frac{c}{2g} \left[ \ln 2 + 3 \tan^{-1} \left( \frac{1}{2} \right) \right]$

$$C) t = \frac{c}{8g} \left[ \ln 3 + 2 \tan^{-1} \left( \frac{1}{2} \right) \right]$$

$$D) t = \frac{c}{4g} \left[ \ln 3 + 2 \tan^{-1} \left( \frac{1}{2} \right) \right]$$

9. 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

10.  $\int_0^{-2} \frac{1}{1-x} dx$  is    A) not possible    B)  $-\ln 3$     C)  $\ln 3$     D)  $-\frac{1}{2} \ln 3$

11.  $\int_0^1 \frac{1}{1+a^2x^2} dx = \frac{\pi}{4}$  Then the value of  $a$  is: A) 1    B) -1    C)  $\frac{\pi}{4}$     D)  $-\frac{\pi}{4}$

12.  $\int \sin^4 \theta d(\sin \theta)$  is the same as integrating wrt  $\theta$  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

13. 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

14. 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

15. 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)  $x^2 + y^2 - 6x - 8y = 2$

16. 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)  $r_1 r_2$

17. If  $z$  is any cube root of unity, the value of  $z^2 + z$  is

2 A) 1 B) 0 C) -1 D)

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)  $\frac{1}{2}$  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 5<sup>th</sup> 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