

ENTRANCE EXAMS

Mathematics

Duration: **2 hours**

1. Factorize the polynomial $p(x) = x^3 + 2x^2 - x - 2$ completely
 - a) $(x + 1)$ is a factor of $p(x)$. True or False? 0.5mk
 - b) Divide $p(x)$ by $(x+1)$ the remain is -6. True or False? 0.5mk
 - c) $p(x) \equiv (x + 1)^2(x + 2)$. True or False? 0.5mk
2. Consider the quadratic equation $x^2 - 2x - k = 0$
 - a) The value of k for which the equation has equal roots is (0.5mk)
 - b) The solution to the quadratic equation is (0.5mk)
3. Consider the logarithmic equation $x + 3 = 4$
 - a) $3 \equiv \frac{1}{x}$. True or False? (0.5mk)
 - b) The solution to the equation is and....
4. Let $A = \{1, 2, 3, 4, 5\}$ and R defined on A by aRb if and only if $a + b$ is even.
 - a) R is Anti-Symmetric. True or False? 0.5mk
 - b) R is an equivalence relation. True or False? 0.5mk
5. The function $g: R - \left\{\frac{1}{2}\right\} \rightarrow R, g(x) = \frac{1+x}{1+2x}$
 - a) State the range of g . *Ans* = $R - \left\{\frac{1}{2}\right\}$ 0.5mk
 - b) g is and odd function. True or False? 0.5mk
6. In a certain AP with first term 3, the sum of the 1st term and the 5th term is 18.
 - a) Find the common difference. *Ans* = 3 0.5mk
 - b) The sum of the first ten terms is 165. True or False? 0.5mk
7. $\frac{5}{(1+3x)(1-2x)} \equiv \frac{A}{1+3x} + \frac{B}{1-2x}$.
 - a) The value of A and B is ...and... respectively . *Ans* = 3, 2 0.5mk
 - b) The range of values of x of which the expansion is valid is.....
Ans = $-\frac{1}{3} < x < \frac{1}{3}$ 0,5mk

ENTRANCE EXAMS

8. $\frac{\sin\theta + \sin 2\theta}{1 + \cos\theta + \cos 2\theta} \equiv \tan\theta$. True or False? 0.5mk

9. Given that $f(\theta) = \sin\theta - \sqrt{3}\cos\theta$, express $f(\theta)$ in the form $r\sin(\theta - \alpha)$, where $r > 0$ and α is acute.

a) If $f(\theta) \equiv r\sin(\theta - \alpha)$ then r and α is respectively.....and..... 1mk

b) The Maximum and Minimum value of $\frac{2}{f(\theta)+3}$ is.....and....respectively. 1mk

10. If the sum of the first n terms of a series is given by $s_n = 2n^2 + n$

a) $4n + 3$ is an expression of the n th term of this series. True or False? 0.5mk

b) This series is an Arithmetic sequence. True or False? 0.5mk

11. A function

$f(x) \begin{cases} x^2 - 3 & \text{for } 0 \leq x < 2 \\ 4x - 7 & \text{for } 2 \leq x < 4 \end{cases}$ is such that $f(x) = f(x + 4)$

a) State the period of this function. Ans = 4 0.5mk

b) Find, $f(27) = \dots$ and $f(-160) = \dots$ 0.5mk*2

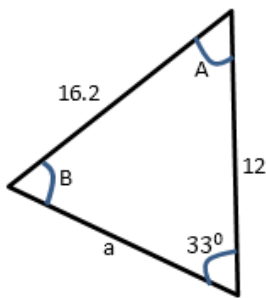
12. Two Circles with radius r_1, r_2 and centers C_1, C_2 respectively are said to be orthogonal if;

a) $dist(C_1, C_2)^2 = r_1^2 + r_2^2$

b) $dist(C_1, C_2)^2 = r_1 + r_2$ 0,5mk

c) $dist(C_1, C_2)^2 = |r_1 - r_2|$

13.



a) $A = \dots\dots\dots$ 0.5mk

b) $a = \dots\dots\dots$ 0.5mk

c) $B = \dots\dots\dots$ 0.5mk

13. Simplify the following leaving your answer in Surds

a) $\tan 60^\circ = \dots\dots\dots$ 0.5mk

ENTRANCE EXAMS

b) $\sin 105^\circ = \dots\dots$ 0.5mk

14. Given that $Z_1 = \sqrt{3} + i$ and $Z_2 = 1 - 3i$

a) The modulus of $\frac{Z_1}{Z_2}$ is.....0.5mk

b) The argument of $\frac{Z_1}{Z_2}$ is..... 0.5mk

15. Given the function of a curve $y = \frac{x}{(x-1)(x-4)}$

a) State the Vertical asymptotes..... 0,5*2mk

b) The Horizontal asymptote is at $y = 1$. True or False 0.5mk

c) The (2, 1) is a turning point of the curve y . True or False 0.5mk

16. Let $A = \{1, 2, 4\}$ and R be a relation defined on A . Given that

$$R = \{(1, 1), (1, 4), (2, 2), (2, 1), (2, 4), (1, 2), (4, 1), (4, 2), (4, 4)\}. R \text{ is}$$

A) *Reflexive* B) *Symmetric*

C) *Anti – symmetric* D) *Transitive* 0,5mk

17. When simplified $\frac{2}{x-1} - \frac{1}{1+x}$ reduces to:

A) $\frac{x+3}{(x-1)x}$ B) $\frac{x+3}{x^2-1}$ C) $\frac{3(x+1)}{x^2-1}$ D) $\frac{x+2}{x^2-1}$

0,5mk

18. The value of angle t that is angle PSQ in **Figure 1** above is



A) 64° B) 42° C) 22° D) 18°

0,5mk

19. The radius of the circle whose equation is $x^2 + y^2 - 6x + 4y + 4 = 0$ is;

A) 6 B) $\sqrt{6}$ C) 4 D) 3 0,5mk