AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XI EXAMINATION

MAY 2012

Mathematics Paper I

Time allowed: 45 minutes   Marks 35

INSTRUCTIONS

1. Read each question carefully.

2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.

3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 35 only.

4. In each question there are four choices A, B, C, D. Choose ONE. On the answer grid black out the circle for your choice with a pencil as shown below.

Candidate's Signature

5. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.

6. DO NOT write anything in the answer grid. The computer only records what is in the circles.

7. You may use a scientific calculator if you wish.

1. The multiplicative inverse of i^2 is

    A. $-i$
    B. i
    C. -1
    D. 1

2. If $\bar{z} = 2 - i$ and $z = x + yi$, then the value of y is equal to

    A. -2
    B. -1
    C. 1
    D. 2

3. i (iota) is one of the roots of the equation

    A. $x^2 = -2$
    B. $x^2 = -1$
    C. $x^2 = 1$
    D. $x^2 = 2$

4. $\begin{bmatrix} a & b & c \\ 0 & d & e \\ 0 & 0 & f \end{bmatrix}$ is an example of

    A. lower triangular matrix.
    B. upper triangular matrix.
    C. diagonal matrix.
    D. rectangular matrix.

5. If $A = \begin{bmatrix} 3 & 2 & 3 \\ 5 & 1 & 1 \\ 2 & 1 & 0 \end{bmatrix}$, then the co-factor A_{11} of the element in the first row and first column

    is equal to

    A. -3
    B. -1
    C. 0
    D. 1

6. If $A = \begin{bmatrix} 0 & 0 & a \\ 0 & a & 0 \\ a & 0 & 0 \end{bmatrix}$, then the determinant of matrix A is equal to

    A. $-a^3$
    B. a^3
    C. $3a$
    D. $-3a$

7. If B is a matrix of order $(p \times q)$, then the order of matrix λB is

[**Note**: λ is a scalar]

   A. $\lambda\, p \times q$
   B. $p \times \lambda q$
   C. $\lambda\, p \times \lambda q$
   D. $p \times q$

8. For any matrix A and B, if $|B| = -2$ and $A = B^{t}$, then $|A|$ is equal to

   A. -2
   B. $-\dfrac{1}{2}$
   C. $\dfrac{1}{2}$
   D. 2

9. In an arithmetic progression if the sixth term is -3 and the fifth term is $2 + 4d$, then the common difference d is equal to

   A. -1
   B. $-\dfrac{1}{3}$
   C. $-\dfrac{2}{3}$
   D. $-\dfrac{5}{3}$

10. The $(n+1)^{th}$ term of the geometric progression 1, – 1, 1, –1, …… is

   A. $(-1)^{n-1}$
   B. $(-1)^{n}$
   C. $(-1)^{1-n}$
   D. $(-1)^{n+1}$

11. If the harmonic means H_{1} and H_{2} between any two numbers are 4 and 6 respectively, then the third term of the associated arithmetic progression is equal to

   A. $\dfrac{1}{4}$
   B. $\dfrac{1}{6}$
   C. $\dfrac{1}{8}$
   D. $\dfrac{1}{10}$

PLEASE TURN OVER THE PAGE

12. The nth term of arithmetico - geometric series is

    A. $\{a + (n - 1)d\}\,ar^{n-1}$
    B. $\{a + nd\}\,r^{n-1}$
    C. $\{a + (n - 1)d\}\,r^{n-1}$
    D. $\{a + nd\}\,ar^{n-1}$

13. In factorial form $n(n-1)$ is equal to

    A. $n!$
    B. $(n - 1)!$
    C. $n(n - 1)!$
    D. $\dfrac{n(n - 1)(n - 2)!}{(n - 2)!}$

14. If there are n different objects to fill up r places , then the rth place can be filled in
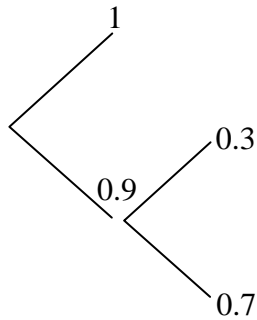
    A. $(n - r)$ ways
    B. $(n - r - 1)$ ways
    C. $(n - r + 1)$ ways
    D. $(n + r - 1)$ ways

15. If E and F are independent events and $P(E/F) = \dfrac{1}{3}$, $P(F) = \dfrac{1}{4}$, then $P(E)$ is equal to
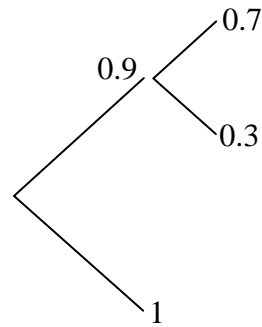
    A. $\dfrac{1}{3}$
    B. $\dfrac{1}{4}$
    C. $\dfrac{2}{3}$
    D. $\dfrac{3}{4}$

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16. Which of the following tree diagrams is correct for the given probabilities ?

A.

1

0.3

0.9

0.7

B.

0.7

0.9

0.3

1

C.

0.7

0.3

0.9

1

D.

0.7
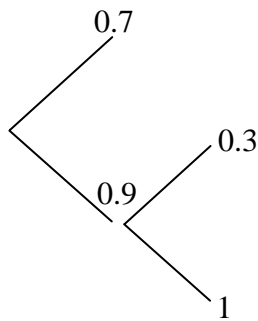
0.9
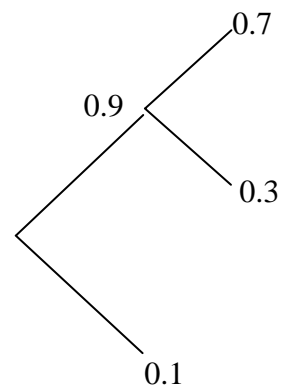
0.3

0.1

17. The sum of exponents of $2x$ and $3y$ in the expansion of $(2x + 3y)^n$ is equal to

    A. n
    B. $2n$
    C. $n + 1$
    D. $2n + 1$

18. The number of terms in the expansion of $(1 + a)^4 + (1 - a)^4$ is equal to

    A.   3
    B.   6
    C.   8
    D.   10

19. The equation $x^{\frac{1}{3}} - x^{\frac{1}{6}} = 6$ can be reduced to a quadratic form as

    A. $y + y^2 + 6 = 0$
    B. $y^2 - y + 6 = 0$
    C. $y + y^2 - 6 = 0$
    D. $y^2 - y - 6 = 0$

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20. If ω is a complex cube root of unity, then $\sqrt{1 + \omega^2}$ is equal to

   A. $\sqrt{\omega}$
   B. $\sqrt{\omega}\ i$
   C. $-\omega$
   D. $\omega\ i$

21. The number of imaginary roots in cube roots of -27 is

   A.   0
   B.   1
   C.   2
   D.   3

22. For the given synthetic division, the value of y is equal to

2	1	0	-1	2	3
		2	?	y	16
	1	2	?		19

   A. -6
   B. -2
   C.   5
   D.   6

23. If $f^{-1}(x) = 5$, then $f^{-1}(x + 1)$ is equal to

   A. $\dfrac{1}{6}$
   B. $\dfrac{1}{5}$
   C.   5
   D.   6

24. Which of the following inequalities represent/s a closed half plane ?

   I. $ax + by \leq c$
   II. $ax + by \geq c$
   III. $ax + by < c$

   A.   I only
   B.   II only
   C.   I and II only
   D.   II and III only

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25. Which of the following corner points represent the minimum value of $2x + 2y$?

    I.   (0 , 4)
    II.   (3 , 1)
    III. (4 , 2)

    A.   I only
    B.   III only
    C.   I and II only
    D.   II and III only

26. Which of the following objective functions is valid for a linear programming problem ?

    A.   maximize $f(x, y) = 6xy$
    B.   maximize $f(x, y) = x^2 + y$
    C.   maximize $f(x, y) = 2x + 5y$
    D.   maximize $f(x, y) = \dfrac{x + y}{x}$

27. Which of the following formulae is the fundamental law of trigonometry ?

    A. $\cos(\alpha - \beta) = \cos\alpha \cos\beta + \sin\alpha \sin\beta$
    B. $\cos(\alpha + \beta) = \cos\alpha \cos\beta - \sin\alpha \sin\beta$
    C. $\sin(\alpha - \beta) = \sin\alpha \cos\beta - \cos\alpha \sin\beta$
    D. $\sin(\alpha + \beta) = \sin\alpha \cos\beta + \cos\alpha \sin\beta$

28. Which of the following formulas is/are equal to $\cos\theta$?

    I. $\sin\left(\dfrac{\pi}{2} - \theta\right)$

    II. $\sin\left(\dfrac{\pi}{2} + \theta\right)$

    III. $\sin\left(\dfrac{3\pi}{2} - \theta\right)$

    A.   I only
    B.   III only
    C.   I and II only
    D.   I and III only

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29. If $a \sin \theta + b \cos \theta = r \sin(\theta + \alpha)$, then the value of r is equal to

    A. $a^2 + b^2$
    B. $a^2 - b^2$
    C. $\sqrt{a^2 + b^2}$
    D. $\sqrt{a^2 - b^2}$

30. The law of cosine $c^2 = a^2 + b^2 - 2ab \cos \gamma$ reduces to $c^2 = a^2 + b^2$, if γ is equal to

    A. $30°$
    B. $45°$
    C. $60°$
    D. $90°$

31. If $\sin \dfrac{\alpha}{2} = \sqrt{\dfrac{(s-b)(s-c)}{bc}}$, then the angle $\dfrac{\alpha}{2}$ lies in the interval

    A. $0 < \dfrac{\alpha}{2} < \dfrac{\pi}{2}$

    B. $0 < \dfrac{\alpha}{2} < \pi$

    C. $0 < \dfrac{\alpha}{2} < \dfrac{3\pi}{2}$

    D. $0 < \dfrac{\alpha}{2} < 2\pi$

32. If a circle is drawn in such a way that it touches the three sides of a triangle, then the circle is called

    I.   circumscribed.
    II. inscribed.
    III. escribed.

    A. I only
    B. II only
    C. I and III only
    D. II and III only

33. The period of $\dfrac{1}{7} \cos a\,x$ is

    A. $\dfrac{2\pi}{7\,a}$

    B. $\dfrac{2\pi}{a}$

    C. $\dfrac{\pi}{7\,a}$

    D. $\dfrac{\pi}{a}$

34. Which of the following relations is FALSE ?

    A. $\sin(-\theta) = -\sin\theta$
    B. $\sin(\pi - \theta) = -\sin\theta$
    C. $\sin(\theta - \pi) = -\sin\theta$
    D. $\sin(\theta + 2\pi) = \sin\theta$

35. Which of the following trigonometric functions is an even function ?

    A. $\sin x$
    B. $\cos x$
    C. $\sin x + \cos x$
    D. $\sin x - \cos x$

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