Sub.Code : 0081'A'

NEB-GRADE XII

2079 (2022)

Mathematics

Grade Increment (Supplementary) Examination

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Time: 3 hrs. **Full Marks: 75**

Attempt **all** the questions.

Group 'A' 11×1=11

Rewrite the correct options of each questions in your answer sheet.

1. The $(k+1)^{th}$ the term of $(a+b)^n$ is ...

   A) $\binom{n}{k} a^k b^k$ B) $\binom{n}{k} (ab)^{n-k}$

   C) $\binom{n}{k} a^{n-k} b^k$ D) $\binom{n}{k} a^{n-k} b^{n-k}$

2. Let P = { a, b }. The number of binary operations that can be defined on P is...

   A) 2 B) 4 C) 8 D) 16

3. The value of Arc tan (45^o) is

   A) $(\pi)^c$ B) $\left(\frac{\pi}{3}\right)^c$ C) $\left(\frac{\pi}{4}\right)^c$ D) $\left(\frac{\pi}{6}\right)^c$

4. If $\tan 2\theta = -\tan\theta$, then θ is equal to ....

   A) $n\pi$, $n \in Z$ B) $\frac{n\pi+\pi}{3}, n\in Z$ C) $\frac{n\pi}{4}; n \in Z$ D) $\frac{n\pi}{6}, n \in Z$

5. $x^2 = 5y^2 + 20$ represents the equation of a conic section. The ecentricity (e) of the conic section is always...

   A) e = 0 B) e = 1 C) e >1 D) e< 1

6. If $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $|\vec{a} \times \vec{b}| = 16$ and θ is angle between $\vec{a}$ and $\vec{b}$ then θ is...

   A) $\sin^{-1}\left(\frac{4}{5}\right)$ B) $\cos^{-1}\left(\frac{3}{5}\right)$ C) $\cos^{-1}\left(\frac{4}{5}\right)$ D) $\frac{\pi}{2}$

Contd...

7. The mean of binomial distribution $(a+b)^n$ is ...

   A) $\sqrt{np}$ B) $\sqrt{npq}$ C) np D) npq

8. $\int \frac{1}{\sqrt{1-x^2}}\,dx$ is equal to ...

   A) $\tan^{-1}x + k$ B) $\cos^{-1}x + k$ C) $\sec^{-1}x + k$ D) $\sin^{-1}x + k$

9. $\lim_{x \to 0} \frac{\sin x}{x}$ is equal to ...

   A) $-\infty$ B) 0 C) 1 D) ∞

10. The system of linear equations $2x - y = 0$ and $2x + y = 3$ has...

    A) No solution B) infinitely many solutions
    C) one solution D) more than one solutions, but finite

11. The moment of moving body is defined as

    A) mass × acceleration B) mass × velocity
    C) speed × time D) time × acceleration

Or

The demand function and supply function are defined as $16 - x^2$ and $4+x$ respectively. The quadratic equation under the pure competion is defined as...

a) $x^2+x+12=0$ b) $x^2+x - 12=0$
c) $x^2-x-12=0$ d) $x^2+x+12=0$

Group 'B' 8×5=40

12. If the equations $x^2+px+q=0$ and $x^2+qx+p=0$ have a common root, prove that either $p = q$ and $p+q+1=0$

13. a) Use mathematical induction and prove that $1+2+3+...+n = \frac{n(n+1)}{2}$ 3

    b) Show that $\frac{2}{3!} + \frac{4}{5!} + \frac{6}{7!} + ... = e^{-1}$ 2

14. a) Solve for θ : $\sin 3\theta = \sin 2\theta - \sin\theta$ 3

    b) Define vector product of two vectors $\vec{a}$ and $\vec{b}$ .Write a formula that represents the application of vector product to plane trigonometry. 2

Contd...

15. The following data give the diffusion time (hours) of a silicon water used in manufacturing integrated circuits and the resulting sheet resistance of transfer.

Diffusion time (x)	0.52	0.20	1.35	2.00	2.50
Sheet resistancel (y)	82.50	89.00	91.20	94.40	81.60

i) Find the regression equation *y* on *x*. 4
ii) Predict the sheet resistance when the diffusion time is 2.6 hrs. 1

16 a) State Lagrange's Mean-Value thorem and give it's geometrical interprection. 2
b) Give an example of exact differential equation, homogenous differential equation and a standard integral. 3

17. a) Evaluate : $\int \frac{dx}{1-3\sin x}$ 3
b) Solve : $ydx - xdy = 0$ 2

18. Use simplex method and maximize $P(x, y) = 9x-2y$ subject to contraints $x+y \leq 4,\ 3x+2y \leq 9,\ x \geq 0,\ y \geq 0$. 5

19. a) A particle is thrown with an initial velocity of 120 ms^{-1} at an angle of 30^o above the horizontal. find
a) the time to attain the highest point 1
b) the time of flight 1
c) the horizontal range 1
d) the maximum height 1
e) the ratio of the maximum height to horizontal range 1

Or

The input-output coefficient (A) and the demand vector (D) are given as $A = \begin{bmatrix} 0.2 & 0.2 \\ 0.1 & 0.4 \end{bmatrix}$ and $D = \begin{bmatrix} 64 \\ 128 \end{bmatrix}$. Find the total output. 5

Group 'C' 3×8=24

20. a) A woman has 8 close friends. Find the ways she can invite 3 to dinner where.
i) there are no restrictions. 2
ii) two of the friends are married to each other and will not sit separately. 2
iii) two of the friends are not speaking to each other and will not sit together. 2

b) Apply De-moivre's theorem to compute $[-1-\sqrt{3}i]^4$ 2

21. a) Write the direction cosine of x-axis. Find the condition of perpendicular lines for finding angle between the lines having direction cosines *l, m, n*. *l,m,n* satisfy the equations $l+m+n=0$ and $2lm-mn+2nl=0$ 7

b) What does $\vec{a} \times \vec{b} = \vec{0}$ mean ? 1

22. a) Find the derivative of log $(sec x^2)$ with respect to x from the first principle. 6

b) Integrate $\int \frac{1}{(4+x^2)(9+x^2)} dx$ 2

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