2024

MATRICULATION EXAMINATION

DEPARTMENT OF MYANMAR EXAMINATIONS

MATHEMATICS **Time Allowed: (3) Hours**

Answer ALL Questions. Write your answers in the answer booklet.

Section A (Each question carries 1 mark.)

Choose the correct or the most appropriate answer for each question. Write the letter of the correct or the most appropriate answer.

1. The trigonometric form of $z = 1 + i$ with $-\pi < \theta \leq \pi$ is

   A. $\sqrt{2}(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4})$ B. $\sqrt{2}(\cos\frac{\pi}{4} - i\sin\frac{\pi}{4})$

   C. $2(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3})$ D. $2(\cos\frac{\pi}{3} - i\sin\frac{\pi}{3})$

2. The plane passing through the point (1, 2, 3) and parallel to the plane $x+y+z=0$ is

   A. $x+y+z=6$ B. $x+y+z+6=0$

   C. $x+y+z=5$ D. $x+2y+3z=0$

3. In how many ways can all the letters of the word ORANGE be arranged, without repeating any letters?

   A. 730 B. 270 C. 720 D. 780

4. The directrix of the equation $y^2 - 12x - 6y + 3 = 0$ is

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

5. The period of the function $y = 2\cos\pi(x+2)+1$ is

   A. 1 B. 2 C. 3 D. π

6. The domain of the function $y=3\ln|x+3|+\pi$ is

A. $\mathbf{R}$ B. $\{x:0<x<\pi\}$ C. $\{x : x \neq 3\}$ D. $\{x : x>3\}$

7. In exponential function $y = 4^{-x^2}$, when x becomes large, the value of y close to

A. 1 B. 0 C. 2 D. none of these

8. How many inflection points are there in the graph of $x^4 + 4x^3 + 5$?

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

9. The integration $\int(1-\tan^2(2x+1))\,dx$ gives

A. $\ln\cos(2x+1)$ B. $2x-\frac{1}{2}\tan(2x+1)$

C. $2\tan(2x+1)$ D. $\frac{1}{2}\ln\cos(2x+1)$

10. If $\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \tan x\,dx$ is equal to $\ln p$, then p^2 is

A. $\frac{\pi}{4}$ B. 1 C. $\frac{1}{4}$ D. $\frac{4}{3}$

Section B (Each question carries 2 marks.)

Write only the solution of each question. (There is no need to show your working.)

11. Calculate $\frac{2-3i}{3-i}$.

12. If P is (3, 1, 2) and Q is (1, 1, 3), find $|\overrightarrow{PQ}|$.

13. In how many ways can a president, a treasurer and a secretary for a committee be selected from a group of 9 people?

14. Find the center and radius of the circle $x^2 + 2x + y^2 + 4y + 4 = 0$.

15. Restrict the appropriate domain of $y = \sin x$ to be a one-to-one function.

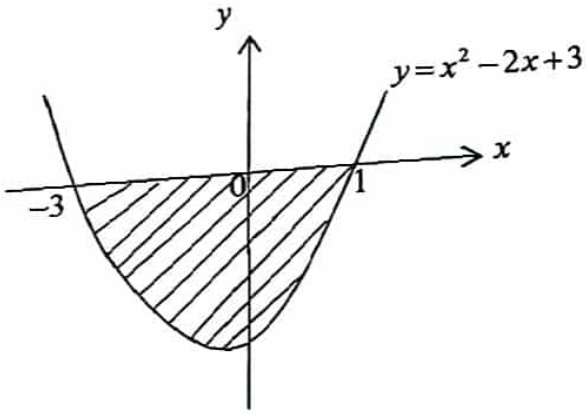
16. Find a so that the graph of $y = \log_a x$ passes through the point (4, 2).

17. Find the critical points of the function $f(x) = x^3(x-4)$.

18. Write down your answer of $\int \frac{1}{3+4x} dx$.

19. Find $\int \frac{2x+1}{x^2+x+6} dx$.

20. Find the shaded area.



Section C (Each question carries 3 marks.)

21. Find the square roots of $z = \sqrt{3} + i$.

22. Prove that $n^3 + 2n$ is divisible by 3 for all natural numbers n by using the mathematical induction.

23. Find the points of intersection of the line joining the two points (1, 3, 5) and (3, 5, – 4) with the xy - plane.

24. Let $\vec{a} = \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix}$ and $\vec{c} = \begin{pmatrix} -1 \\ p \\ q \end{pmatrix}$. Find the values of p and q such that $\vec{c}$ is parallel to $\vec{a}$.

25. A music class consists of 3 piano players, 6 guitarists and 5 violinists. A band of 1 piano player, 4 guitarists and 3 violinists must be chosen to play at a school concert. In how many ways can the band be chosen?

26. Find the general form of the equation of the parabola with vertex (3, 1) and focus (3, 4).

27. Draw the graph of $y = 3 \log_2 x$.

28. If $y = x^2+2x+3$, show that $\left(\frac{dy}{dx}\right)^2 + \left(\frac{d^2y}{dx^2}\right)^3 = 4y$.

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29. Evaluate $\int 3x\sqrt{x^2-5}\,dx$.

30. Evaluate $\int_0^6 \left(\frac{1}{3}x+1\right)^3 dx$.

Section D (Each question carries 5 marks.)

31. Solve $z^4 = 1$.

32. Prove that $1^2 + 3^2 + 5^2 + \ldots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$ by using the mathematical induction principle for all natural numbers n.

33. Find the equation of the sphere with center $(5, -6, -2)$ and touching the plane $3x - y - 2z = 17$.

34. How many different 4-digit codes can be formed using all the digits 1, 2, 3, 4 if

(i) there is no restriction?

(ii) repetition is not allowed?

(iii) repetition is not allowed, and 1 is either the first or the last digit?

35. Write the standard form and sketch the graph of $y^2 - 8x - 6y - 23 = 0$, showing the vertex, focus, directrix and end points of the latus rectum.

36. From the graph of $y = \sin x$, draw step-by-step transformation graphs to get the graph of $y = 2\sin\frac{1}{2}x$.

37. Find and classify the critical points of the function $f(x) = x^3 - 3x + 2$.

38. Find the volume of revolution formed when the curve $y = \sin x$ for $\frac{\pi}{3} \le x \le \pi$, is rotated through 360° about the x - axis.