2025
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. If $z_1=(r,\theta)=(2,\pi)$ and $z_2=(r,\theta)=(4,\frac{\pi}{2})$, then the value of the conjugate of $\frac{z_2}{z_1}$ is

   A. $2i$ B. $-2i$ C. i D. $-i$

2. If the points $(-1,3,2)$ and $(4,5,0)$ lie on the plane $ax+by-3z=2$, then the value of b is

   A. 1 B. 2 C. 3 D. 4

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

   A. 40230 B. 40500 C. 43200 D. 40320

4. The equation of directrix of the parabola $x^2+4x+4y+32=0$ is

   A. $y=-6$ B. $y=0$ C. $y=6$ D. $y=\frac{3}{2}$

5. The trigonometric function with a period $\frac{\pi}{2}$ is

   A. $\sin\frac{1}{2}x$ B. $\cos 2x$ C. $\tan\frac{1}{2}x$ D. $\cot 2x$

6. The asymptote of the graph $y=\log_{\frac{1}{2}}(x-2)+3$ is

   A. $x=0$ B. $x=1$ C. $x=2$ D. $x=3$

7. The y-intersect of the graph $y=4e^{-x}+7$ is

   A. 9 B. 10 C. 11 D. 12

8. The critical points of $f(x)=\sqrt[3]{x^4}-4\sqrt[3]{x}$ are

   A. (1,−3) and (8,0) B. (8,0) and (0,0)

   C. (1,3) and (0,0) D. (1,−3) and (0,0)

9. If $\int\frac{2}{\sqrt{x}}\sin\sqrt{x}\,dx=p\cos\sqrt{x}+C$, then p is

   A. −6 B. −4 C. −2 D. 4

10. If $\int_0^{\frac{\pi}{4}} \sin x \sec x\,dx = -\ln a$, then a^2 is

A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{1}{4}$ D. $\frac{3}{4}$

Section B (Each question carries 2 marks.)

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

11. Given that $z = -2\sqrt{3} - 2i$, find z^6. Give your answer in the form $z = x + yi$ where x and y are real numbers.

12. Find the equation of the sphere on the join of the two points $(1,-2,-3)$ and $(3,4,1)$ as diameter.

13. If ${}^{m+n}P_2 = 56$, ${}^{m-n}P_2 = 12$, find $m+2n$.

14. The line $x-1=0$ is the directrix of a parabola $(y-1)^2 = k(x+2)$. Find the value of k.

15. Find the sum of amplitude and period of the graph of $y = 3\cos\frac{\pi}{4}x$.

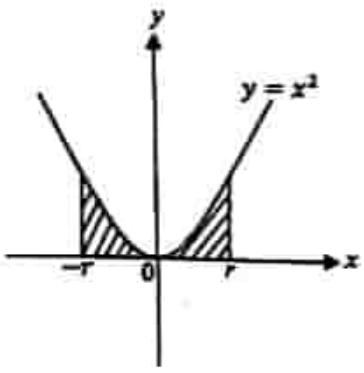
16. If the point $(2,1)$ is on the graph of $y = 5^x$, then find the corresponding point on the graph of $y = 3.5^{x-2} + 1$.

17. Find sum of the global minimum and global maximum values of the function $f(x) = x^2 + 2x - 12$ on $[-3,3]$.

18. Find $\int 2x \sin 2x \cos 2x\,dx$.

19. Evaluate $\int \frac{5x-7}{x^2-3x+2}dx$.

20. The shaded area is $6r$ unit^2. Find the value of r.



Section C (Each question carries 3 marks.)

21. Find the square roots of $z=-8-8\sqrt{3}\,i$.

22. Use the principle of mathematical induction to prove that $2n+1<n^2$ for all natural numbers $n\geq 3$.

23. In parallelogram $ABCD$, A is $(2,-1,4)$, B is $(5,1,2)$ and C is $(3,1,4)$. Find the coordinates of D.

24. The points $A(1,2,3)$, $B(2,5,-1)$ and $C(3,0,1)$ are vertices of a parallelogram $ABCD$. Find the area of the parallelogram.

25. A football team consists of a goalkeeper, two defense players, four midfield players and four forwards. Three players are chosen to collect a medal at the closing ceremony of a competition. How many selections are possible if one midfield player, one defense player and one forward must be chosen ?

26. Sketch the graph of the parabola $(x+3)^2=-4(y-1)$ showing the vertex, focus, directrix and end points of latus rectum.

27. From the graph of $y=\log_{\frac{1}{2}} x$, draw step by step transformation graph to get the graph of $y=\log_{\frac{1}{2}}(x-1)+3$. Find the equation of the asymptote.

28. If $x\ln y+e^{xy}=3^x y^3$, find $\dfrac{dy}{dx}$.

29. Find the function $g(x)$ satisfying the equation $g'(x)=e^{-x}\sec^2(\pi e^{-x})$ with $g(\ln 4)=\dfrac{2}{\pi}$.

30. Find the area of the region enclosed by the curve $y=x^4$ and the line $y=8x$.

Section D (Each question carries 5 marks.)

31. Find all the solutions of $z^4+16=0$ and indicate their positions on the xy-coordinate plane.

32. Prove that $\dfrac{1}{1\cdot 3}+\dfrac{1}{3\cdot 5}+\dfrac{1}{5\cdot 7}+\cdots+\dfrac{1}{(2n-1)(2n+1)}=\dfrac{n}{2n+1}$ for all natural numbers n by the use of the mathematical induction principle.

33. Find the equation of the sphere with center $(2,1,-1)$ and touching the plane $x+3y+2z-17=0$.

34. How many permutations of the letters S,I,N,G,A,P,O,R,E are there if

(i) the 4 vowels are placed together ?
(ii) the 4 vowels are not placed together?
(iii) consonants and vowels do not appear alternately?

35. Rotate the coordinate axes to remove the xy-term of the equation $(\sqrt{3}x-y)^2=-2(x+\sqrt{3}y)$ in $x'y'$-coordinate system. Then sketch the graph.

36. Draw the graph of $y=3\sin\frac{\pi}{3}(x-1)+4$.

37. A cylinder has a height of h meters and a radius of r meters. If the sum of the height and radius of the cylinder is 3 meters, find an expression for the volume of the cylinder in terms of r. Find also the maximum volume of the cylinder.

38. Find the area of the region bounded by the graph of $y=|x-2|$ and the x-axis for $1\le x\le 4$.
