

နိုင်ငံခြားတစ်ဌာနများတွင်စစ်ဆေးသည့်မေးခွန်းလွှာ

2020

MATRICULATION EXAMINATION
DEPARTMENT OF MYANMAR EXAMINATION
MATHEMATICS **Time Allowed: (3) Hours**
WRITE YOUR ANSWERS IN THE ANSWER BOOKLET.

SECTION (A)
 (Answer ALL questions)

1.(a) Functions f and g are defined by $f(x) = 3x + 4$, $g(x) = x^2 + 6$. Find the values of x for which $(f \circ g)(x) = (g \circ f)(x)$. (3 marks)

(b) x and $x + 2$ are factors of $px^2 - 6x + q$. Find the values of p and q . (3 marks)

2.(a) Find and simplify the coefficient of x^3 in the expansion of $(2 + x)^5 + (1 - 2x)^6$. (3 marks)

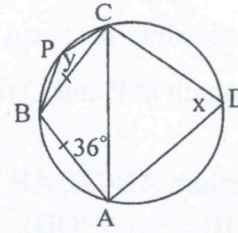
(b) How many terms of an A.P. 24, 20, 16, ... give a sum of 0? (3 marks)

3.(a) The square of the matrix $\begin{pmatrix} x & 1 \\ 0 & 1 \end{pmatrix}$ is $\begin{pmatrix} 4 & -1 \\ 0 & 1 \end{pmatrix}$. Find x . (3 marks)

(b) If a die is rolled x times, the expected frequency of a prime number turns up is 50. Find the value of x . (3 marks)

4.(a) In the given figure, $AB = BC$ find x and y .

(b) If P is a point inside a parallelogram $ABCD$, then prove that $\vec{PA} + \vec{PC} = \vec{PB} + \vec{PD}$.



5.(a) Show that $\frac{1}{1 + \sin \theta} + \frac{1}{1 - \sin \theta} = 2 \sec^2 \theta$. (3 marks)

(b) Given that $f(x) = (3x - 2)^2$, find $f'(x)$ and $f'(-1)$. (3 marks)

SECTION (B)
 (Answer any FOUR questions)

6.(a) Let $f : \mathbb{R} \rightarrow \mathbb{R}$ and $g : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = 3x - 1$ and $g(x) = x + 7$. Find $(f^{-1} \circ g)(x)$ and $(g^{-1} \circ f)(x)$. (5 marks)

(b) $x^3 + ax^2 - x + b$ and $x^3 + bx^2 - 5x + 3a$ have a common factor $x + 2$. Find the values of a and b . Find also the other a common factor. (5 marks)

7.(a) A binary operation \odot on the set of real numbers \mathbb{R} is defined by $x \odot y = (4x + y)^2 - 15x^2$. Is the binary operation commutative? Why? Find also the values of k such that $(k + 1) \odot (k - 2) = 109$. (5 marks)

(b) If the coefficient of x^4 in the expansion of $(3 + 2x)^6$ is equal to the coefficient of x^4 in the expansion of $(k + 3x)^6$, find k . (5 marks)

- 8.(a) Find the solution set of the inequation $(2x + 1)(3x - 1) < 14$ by graphical method and illustrate it on the number line. (5 marks)
- (b) For a certain A.P. $S_n = \frac{n}{2}(3n - 17)$. Find the first 4 terms of the corresponding sequence and a formula for the n^{th} term. (5 marks)
- 9.(a) A G.P. has first term 5 and last term 2560. If the sum of all its terms is 5115, how many terms are there? (5 marks)
- (b) It is given that $A = \begin{pmatrix} 3 & 1 \\ 5 & p \end{pmatrix}$ and that $A + A^{-1} = kI$, where p and k are constants and I is the identity matrix. Find the values of p and k . (5 marks)
- 10.(a) Given that $A = \begin{pmatrix} 4 & -1 \\ -3 & 2 \end{pmatrix}$, use the inverse matrix of A to solve the simultaneous equations $y - 4x + 8 = 0$, $2y - 3x + 1 = 0$. (5 marks)
- (b) How many 2-digit numbers less than 30 can you form by using the digits 0, 1, 2 and 3 if the repetition of any digit is allowed? If one of these numbers is chosen at random, find the probability that it is a multiple of 3. Find also the probability that it is a prime number. (5 marks)

SECTION (C)

(Answer any **THREE** questions)

- 11.(a) Two circles intersect at A and B. At A a tangent is drawn to each circle meeting the circles again at P and Q respectively. Prove that $\angle ABP = \angle ABQ$ and $AB^2 = BP \cdot BQ$. (5 marks)
- (b) In trapezium ABCD, $AB = 3DC$ and $AB \parallel DC$. AC and BD intersect at O. Prove that $\alpha(\triangle AOB) = 9\alpha(\triangle COD)$. (5 marks)
- 12.(a) In $\triangle ABC$, $AB = AC$. P is a point inside the triangle such that $\angle PAB = \angle PBC$. Q is the point on BP produced such that $AQ = AP$. Prove that ABCQ is cyclic. (5 marks)
- (b) Given that $0^\circ < \alpha, \beta < 360^\circ$, $\operatorname{cosec} \alpha = \frac{17}{13}$, $\tan \beta = -\frac{4}{3}$ and α, β are in the same quadrant, calculate the values of $\sin 2\alpha$, $\cos \frac{1}{2}\beta$ and $\cot(\alpha + \beta)$. (5 marks)
- 13.(a) Find the matrix which will rotate 30° and then reflect in the line OY. What is the map of the point $(-1, 0)$? (5 marks)
- (b) If $y = 3e^{\cos x}$, prove that $\frac{d^2y}{dx^2} = (\cot x - \sin x) \frac{dy}{dx}$. (5 marks)
- 14.(a) A and B are two points on the level ground which lie on the opposite sides of a tower CD. The distance between A and B is 649 ft, and the angles of elevation of the top of the tower C from A and B are 48° and 75° respectively. Find the height of the tower CD. (5 marks)
- (b) Find the equations of the tangent and normal lines to the curve $y = x^2 - x - 2$ at the point where it meets the positive X-axis. (5 marks)