နိုင်ငံခြား စာသင်ကျောင်းများတွင်စစ်ဆေးသည့်စာမေးပွဲ

2017

MATRICULATION EXAMINATION

DEPARTMENT OF MYANMAR EXAMINATION

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

WRITE YOUR ANSWERS IN THE ANSWER BOOKLET.

SECTION (A)

(Answer **ALL** questions. Choose the correct or the most appropriate answer for each question. Write the letter of the correct or the most appropriate answer.)

1. (1) If $f(x) = 3x - 1$ and $g(x) = 2x^2 + 3$, then $(g \circ f)(2) =$

   A. 51 B. 53 C. 55 D. 57 E. 59

   (2) An operation $\odot$ is defined by $a \odot b = a^2 - b^2$. Then $(2 \odot 3)(1 \odot 2) =$

   A. 4 B. -4 C. 8 D. -8 E. 15

   (3) When $(2x + k)^{2017} + (x - 1)^2$ is divided by $x + 1$, the remainder is 5, then $k =$

   A. -1 B. 1 C. -3 D. 6 E. 3

   (4) If $x - 2$ is a factor of $x^{n+1} + 5x^n - 10x - 36$, then $n =$

   A. 2 B. 3 C. 4 D. 5 E. 6

   (5) The term independent of x in the expansion of $(x^2 + \frac{a}{x})^6$ is 15, then $a =$

   A. ± 1 B. 1 only C. -1 only D. 4 only E. 6 only

   (6) The sum of all the coefficients of the terms in the expansion of $(3x - 1)^{10}$ is

   A. 256 B. 512 C. 1024 D. 2048 E. none of these

   (7) The solution set of the inequation $kx^2 \le 0$ is R if

   A. $k \le 1$ B. $k > 1$ C. $k < 0$ D. $k > 0$ E. $k > -1$

   (8) In an A.P., $S_{15} = 240$. Then $u_7 + u_8 + u_9 =$

   A. 36 B. 48 C. 54 D. 60 E. 72

   (9) If the A.M. between x and y is 3, then $x^3 + y^3 + 18xy =$

   A. 216 B. 125 C. 64 D. 27 E. 8

   (10) In a G.P., each term is positive, the third term is 18 and the fifth term is 162, then the common ratio is

   A. ± 3 B. -3 only C. 3 only D. 6 only E. ± 6

   (11) Let $A = \begin{pmatrix} 1 & 2 \\ 0 & 4 \end{pmatrix}$ be a matrix and given that $\det(xA) = 4$. Then $x =$

   A. ± 2 B. 4 C. 3 D. ± 1 E. 0

   (12) Given that A is 2×2 matrix such that $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix} A = \begin{pmatrix} 2 & -4 \\ -2 & 4 \end{pmatrix}$, then the matrix A is

   A. $\begin{pmatrix} 2 & 1 \\ -1 & 2 \end{pmatrix}$ B. $\begin{pmatrix} -1 & 2 \\ 1 & -2 \end{pmatrix}$ C. $\begin{pmatrix} 1 & -2 \\ -1 & 2 \end{pmatrix}$ D. $\begin{pmatrix} 2 & -1 \\ 1 & -2 \end{pmatrix}$ E. $\begin{pmatrix} -2 & 1 \\ 1 & 2 \end{pmatrix}$

[P. T. O.

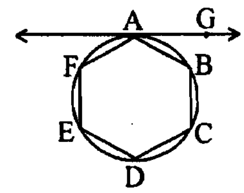
(13) If A is an event such that $6(P(A))^2 = P(\text{not } A)$, then $P(A) =$

A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{1}{6}$ D. $\frac{2}{3}$ E. $\frac{5}{6}$

(14) A die is rolled x times. If the expected frequency of a number which is a multiple of 3 is 30, then the expected frequency of a number not greater than 3 is

A. 90 B. 80 C. 75 D. 60 E. 45

(15) ABCDEF is a regular hexagon inscribed in a circle AG is a tangent at A, then $\angle FAG =$



A. 30° B. 60° C. 150°
D. 120° E. none of these

(16) In circle O, AC is a diameter, PA is a tangent at A, and PBC is a secant meeting the circle at B and C. If the radius of the circle is 2 cm and $\angle APB = 30°$, then the length of the segment PB, in cm, is

A. 2 B. 4 C. 6 D. 8 E. 9

(17) If $\Delta ABC \sim \Delta PQR$, $\alpha(\Delta ABC) + \alpha(\Delta PQR) = 75 \text{ cm}^2$, AB and PQ are corresponding sides and $AB : PQ = 4 : 3$, then $\alpha(\Delta ABC)$, in cm^2, is

A. 25 B. 27 C. 36 D. 48 E. 50

(18) Given that $\overrightarrow{OP} = \begin{pmatrix} p \\ 4 \end{pmatrix}$ and $\overrightarrow{OQ} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$. If $\overrightarrow{PQ}$ is a unit vector, the possible value of p is

A. 1 B. 2 C. 3 D. 4 E. 5

(19) The map of the point (2, – 3) by the reflection matrix in Y-axis is

A. (2, 3) B. (2, – 3) C. (– 2, – 3) D. (– 2, 3) E. (4, 6)

(20) If $\log(\cos x) = k$, then $\log(\sec^3 x) =$

A. $\frac{1}{3}k$ B. $-\frac{1}{3}k$ C. 3k D. – 3k E. none of these

(21) If $180° < \theta < 360°$ and $\tan\theta = -\sqrt{3}$, then $\theta =$

A. 225° B. 240° C. 210° D. 300° E. 330°

(22) In ΔABC, $\angle B = \angle A + 15°$, and $\angle B = \angle C - 15°$. Then $BC : AC =$

A. $1 : \sqrt{2}$ B. $1 : \sqrt{3}$ C. $1 : 2$ D. $\sqrt{2} : \sqrt{3}$ E. $2 : \sqrt{3}$

(23) The gradient of the curve $3x^2 - y^2 = 11$ at the point (3, 4) is

A. $\frac{4}{9}$ B. $\frac{9}{4}$ C. $-\frac{9}{4}$ D. $-\frac{4}{9}$ E. $-\frac{4}{3}$

(24) Given that $y = \sin 4x + \cos^4 x$, then the value of $\frac{dy}{dx}$ when $x = \frac{\pi}{4}$ is

A. – 5 B. 5 C. – 4 D. 4 E. 6

(25) A stationary point of the curve $y = x + \ln(\cos x)$ is at $x =$

A. 0 B. $\frac{\pi}{4}$ C. $\frac{\pi}{3}$ D. $\frac{\pi}{2}$ E. $\frac{2\pi}{3}$

(25 marks)

SECTION (B)

(Answer **ALL** questions)

2. If f and g are functions such that $f(x) = 2x - 1$ and $(g \circ f)(x) = 4x^2 - 2x - 3$, find the formula of g in simplified form. (3 marks)

(OR)

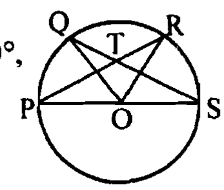
$x^2 - 1$ is a factor of $x^3 + ax^2 - x + b$. When the expression is divided by $x - 2$, the remainder is 15. Find the values of a and b. (3 marks)

3. Given that $\sin^2 x$, $\cos^2 x$ and $5\cos^2 x - 3\sin^2 x$ are in A.P., find the value of $\sin^2 x$. (3 marks)

(OR)

If $\log_2 3$, $\log_5 x$, $\log_3 16$ is a G.P., then find the possible values of x. (3 marks)

4. In circle O, PS is a diameter and $\angle POQ = 60°$, $\angle ROS = 70°$, find $\angle PTQ$.



(3 marks)

5. Prove that $\dfrac{1 + \cos x + \cos 2x}{\sin x + \sin 2x} = \cot x$. (3 marks)

6. Find $\lim\limits_{x \to 2} \dfrac{2^{2x} - 5(2^x) + 4}{2^x - 4}$ and $\lim\limits_{x \to \infty} \dfrac{x^2 - 16}{x^4 - 4x^3}$. (3 marks)

SECTION (C)

(Answer any **SIX** questions)

7.(a) Let f and g be two functions defined by $f(x) = 2x + 1$ and $f(g(x)) = 3x - 1$. Find the formula of $(f \circ g)^{-1}$ and hence find $(f \circ g)^{-1}(8)$. (5 marks)

(b) Let R be the set of real numbers and a binary operation $\odot$ on R be defined by

$$a \odot b = 2ab - a + 4b \qquad \text{for } a, b \in R.$$

Find the values of $3 \odot (2 \odot 4)$ and $(3 \odot 2) \odot 4$. If $x \odot y = 2$ and $x \neq -2$, find the numerical value of $y \odot y$. (5 marks)

8.(a) Given that $4x^4 - 9a^2x^2 + 2(a^2 - 7)x - 18$ is exactly divisible by $2x - 3a$, show that $a^3 - 7a - 6 = 0$ and hence find the possible values of a. (5 marks)

(b) The first four terms in the binomial expression of $(a + b)^n$, in descending powers of a, are w, x, y and z respectively. Show that $(n - 2)xy = 3nwz$. (5 marks)

9.(a) Find the solution set of the inequation $12 - 25x + 12x^2 \le 0$ by graphical method and illustrate it on the number line. (5 marks)

(b) Let a and b be two numbers, x be the single arithmetic mean of a and b. Show that the sum of n arithmetic means between a and b is nx. (5 marks)

[P. T. O.

10.(a) The three numbers a, b, c between 2 and 18 are such that their sum is 25, the numbers 2, a, b are consecutive terms of an arithmetic progression, and the numbers b, c, 18 are consecutive terms of a geometric progression. Find the three numbers. (5 marks)

(b) If $ps \neq qr$, find the 2×2 matrix X such that $\begin{pmatrix} p & q \\ r & s \end{pmatrix} X = \begin{pmatrix} q & p \\ s & r \end{pmatrix}$.

Find also X^{-1}, if it exists. (5 marks)

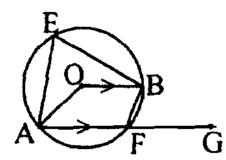
11.(a) Find the inverse of the matrix $\begin{pmatrix} 7 & 4 \\ 3 & 2 \end{pmatrix}$, and use it to find the solution set of the system of equations

$$7x + 4y = 16$$
$$2y + 3x = 6.$$

(5 marks)

(b) X and Y are two independent events. The probability that the event X will occur is twice the probability that the event Y will occur and the probability that Y will not occur is four times the probability that X will not occur. Then find the probability that both X and Y will not occur. (5 marks)

12.(a) In the figure, O is the centre of the circle, AFG // OB, $\angle AOB = 120°$ and $\angle EAG = 80°$. Find $\angle BFG$ and $\angle EBO$. (5 marks)



(b) In ΔABC, AB = AC. P is any point on BC, and Y any point on AP. The circle BPY and CPY cut AB and AC respectively at X and Z. Prove XZ // BC. (5 marks)

13.(a) In trapezium ABCD the diagonals AC and BD intersect at O. If AB // DC and $16\alpha(\Delta AOB) = 25\alpha(\Delta COD)$, find the ratios AB : CD and $\alpha(\Delta BOC) : \alpha(\Delta COD)$.

(5 marks)

(b) The position vectors of A and B relative to an origin O are $\begin{pmatrix} 5 \\ 15 \end{pmatrix}$ and $\begin{pmatrix} 13 \\ 3 \end{pmatrix}$ respectively.

Given that C lies on AB and has position vector $\begin{pmatrix} 2t+1 \\ t+1 \end{pmatrix}$, find the value of t and the ratio AC : CB. (5 marks)

14.(a) Solve the equation $\sin x + \sin \frac{x}{2} = 0$ for $0 \leq x \leq 2\pi$. (5 marks)

(b) A and B are two points on one bank of a straight river, distant from one another 649 m. C is on the other bank and the measures of the angles CAB, CBA are respectively 48° 31′ and 75° 25′. Find the width of the river. (5 marks)

15.(a) Show that the point $(\frac{\pi}{4}, \frac{\pi}{2})$ lies on the curve $x \sin 2y = y \cos 2x$. Then find the equations of tangent and normal to the curve at the point $(\frac{\pi}{4}, \frac{\pi}{2})$. (5 marks)

(b) If $y = A \cos(\ln \frac{x}{2}) + B \sin(\ln \frac{x}{2})$, where A and B are constants, show that $x^2 y'' + x y' + y = 0$. (5 marks)