2016
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) A function f is defined on the set of real numbers by $f: x \mapsto \dfrac{3}{x-2}, x \neq k$. Then the value of k is

A. 3 B. 1 C. 2 D. -1 E. -3

(2) An operation $\odot$ is defined by $x \odot y = \dfrac{3xy}{x+y}$, then the value of x for which $x \odot 2x = 4$ is

A. -3 B. 3 C. 1 D. -1 E. 2

(3) $x^3 - 3x^2 + kx + 7$ is divided by $(x + 3)$, the remainder is 1. Then k =

A. 16 B. 15 C. -16 D. -15 E. 13

(4) If $(x - p)$ is a factor of $4x^3 - (3p + 2)x^2 - (p^2 - 1)x + 3$, then p =

A. $-\dfrac{1}{2}$ or 3 B. $\dfrac{1}{2}$ or -3 C. -1 or $\dfrac{3}{2}$ D. 1 or $-\dfrac{3}{2}$ E. -1 or $\dfrac{2}{3}$

(5) In the expansion of $(3 + kx)^9$, the coefficients of x^3 and x^4 are equal. Then k =

A. 1 B. 2 C. 3 D. -1 E. -2

(6) ${}^nC_0 + {}^nC_{n-1} =$

A. 0 B. 1 C. 2 D. $n + 1$ E. n

(7) The solution set in R for the inequation $(x + 2)^2 > 2x + 7$ is

A. $\{x \mid x > -3\}$ B. $\{x \mid x < 1\}$ C. $\varnothing$ D. R E. $\{x \mid x < -3 \text{ or } x > 1\}$

(8) If p^{th} term of an A.P. is q, and the q^{th} term is p, then the common difference is

A. 0 B. 1 C. -1 D. 2 E. -2

(9) Three positive consecutive terms of a G.P. are $x + 1$, $x + 5$ and $2x + 4$. Then x =

A. 2 B. 7 C. 3 D. 4 E. 1

(10) If x, y, 2x is an A.P. and 3, 9, y is a G.P., then x + y =

A. 45 B. 54 C. 27 D. 9 E. -9

(11) $A = \begin{pmatrix} 2 & 0 \\ 1 & 5 \end{pmatrix}, B = \begin{pmatrix} 1 & 0 \\ 2 & k \end{pmatrix}$. Then the value of k for which AB = BA is

A. -1 B. 1 C. 7 D. -4 E. 4

(12) Given that A is a 2× 2 matrix such that $\begin{pmatrix} 2 & -1 \\ 3 & 4 \end{pmatrix}A + \begin{pmatrix} 1 & 1 \\ -3 & -1 \end{pmatrix}A = \begin{pmatrix} 3 & 6 \\ -3 & 9 \end{pmatrix}$, then the matrix A is

A. $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ B. $\begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$ C. $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ D. $\begin{pmatrix} 2 & -1 \\ -1 & 0 \end{pmatrix}$ E. $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$

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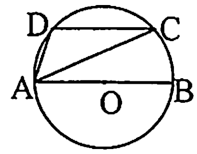
(13) If A is an event such that P(A) = x and P(not A) = y, then $x^3 + y^3$ =
A. 3xy B. 1 + 3xy C. 3xy – 1 D. 1 – 3xy E. none of these

(14) In 100 trials, A is an event and the expected frequency of A is 30, then P(A) =
A. $\frac{3}{10}$ B. $\frac{3}{5}$ C. $\frac{3}{20}$ D. $\frac{1}{30}$ E. $\frac{1}{100}$

(15) In ⊙ O, DC // AB and ∠ CAB = 20°. Then ∠ DAC =
A. 20° B. 15° C. 50°
D. 30° E. 40°



(16) A and B are two points on a circle 3 cm apart. The chord AB is produced to C making BC = 1 cm. Then the length of the tangent from C to the circle is
A. 2 cm B. 1 cm C. 3 cm D. 4 cm E. 5 cm

(17) In the trapezium ABCD, AB is twice DC and AB // DC. If AC and BD intersect at O, then α(ΔAOB) : α(ΔCOD) =
A. 1 : 4 B. 2 : 3 C. 4 : 1 D. 3 : 2 E. none of these

(18) If $\vec{a}, \vec{b}$ are non-parallel and non-zero such that $(3x + y)\vec{a} + (y - 3)\vec{b} = \vec{0}$, then x =
A. 1 B. – 1 C. 3 D. – 3 E. none of these

(19) If P = (3, 4), R = (8, 2) and O is the origin and $\vec{OP} = \vec{OT} - \frac{1}{2}\vec{OR}$, then the coordinates of the point T is
A. (1, 3) B. (2, 4) C. (7, 5) D. (4, 5) E. (5, 7)

(20) What is the smallest value of x for which tan3x = – 1?
A. 15° B. 45° C. 75° D. 90° E. 105°

(21) If A, B, C are the angles of a triangle and tan A = 3 and tan B = 2, then tan C =
A. 1 B. 2 C. 3 D. 4 E. 5

(22) If sin 20° = p, then sec 70° =
A. p B. 2p C. – p D. $\frac{1}{p}$ E. none of these

(23) If $f(x) = 1 - \frac{1}{x}$, then $f'(\frac{1}{2}) =$
A. 2 B. 3 C. 4 D. 5 E. 6

(24) If $V = \frac{4}{3}r^3 - \frac{3}{4}r^2 + r - 5$, then the rate of change of V with respect to r when r = 2 is
A. 6 B. 7 C. 8 D. 9 E. 14

(25) The gradient of normal line to the curve $y = 2\sqrt{x}$ at the point x = 9 is
A. $\frac{1}{3}$ B. $-\frac{1}{3}$ C. 3 D. – 3 E. 6

(25 marks)

SECTION (B)

(Answer **ALL** questions)

2. The function f is defined, for $x \in R$, by $f(x) = 2x - 3$. Find the value of x for which $f(x) = f^{-1}(x)$. (3 marks)

(OR)

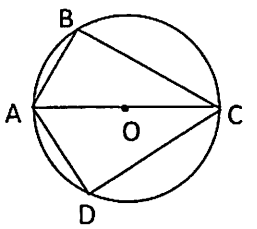
Find the value of k if $4x^7 + 5x^3 - 2kx^2 + 7k - 4$ has a remainder of 12 when divided by $x + 1$. (3 marks)

3. The ninth term of an arithmetic progression is 6. Find the sum of the first 17 terms. (3 marks)

(OR)

A geometric progression is such that the sum of the first 3 terms is 0.973 times the sum to infinity. Find the common ratio. (3 marks)

4. Given: ⊙O with AB = AD and AC is a diameter.
Prove: BC = CD.



(3 marks)

5. Given that A = B + C, prove that tan A – tan B – tan C = tan A tan B tan C. (3 marks)

6. Differentiate $y = \dfrac{1}{x}$ with respect to x from the first principles. (3 marks)

SECTION (C)

(Answer any **SIX** questions)

7.(a) Functions f and g are defined by $f(x) = \dfrac{x}{2-x}, x \neq 2$ and $g(x) = ax + b$. Given that $g^{-1}(7) = 3$ and $(g \circ f)(5) = -7$, calculate the value of a and of b. (5 marks)

(b) A binary operation ⊙ on R is defined by $x \odot y = x^2 - 2xy + 2y^2$. Find $(3 \odot 2) \odot 4$. If $(3 \odot k) - (k \odot 1) = k + 1$, find the values of k. (5 marks)

8.(a) The cubic polynomial f(x) is such that the coefficient of x^3 is – 1 and the roots of the equation f(x) = 0 are 1, 2 and k. Given that f(x) has a remainder of 8 when divided by x – 3, find the value of k and the remainder when f(x) is divided by x + 3. (5 marks)

(b) The expansion of $(3 + 4x)^n$, the coefficients of x^4 and x^5 are in the ratio of 5:16. Find the value of n. (5 marks)

9.(a) Find the solution set in R of the inequation $(x - 6)^2 > x$ by graphical method and illustrate it on the number line. (5 marks)

(b) The third term of an A.P. is 9 and the seventh term is 49. Calculate the thirteenth term. Which term of the progression, if any, is 289? (5 marks)

10.(a) The first and second terms of a G.P. are 10 and 11 respectively. Find the least number of terms such that their sum exceeds 8000. (5 marks)

(b) The matrices A and B are such that $A = (B^{-1})^2$. Given that $B = \begin{pmatrix} 2 & -1 \\ 2 & 1 \end{pmatrix}$, find the value of the constant k for which $kB^{-1} = 4A + I$, where I is the identity matrix of order 2. (5 marks)

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11.(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) Three tennis players A, B, C play each other only once. The probability that A will beat B is $\frac{2}{7}$, that B will beat C is $\frac{1}{3}$ and that C will beat A is $\frac{2}{5}$. Calculate the probability that A wins both games. (5 marks)

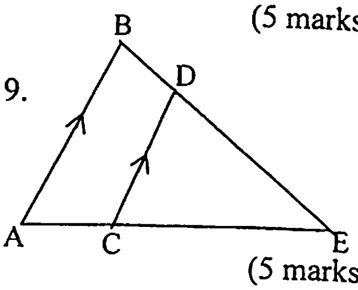
12.(a) Prove that the opposite angles of a quadrilateral inscribed in a circle are supplementary. (5 marks)

(b) ABCD is a parallelogram. Any circle through A and B cuts DA and CB produced at P and Q respectively. Prove that DCQP is cyclic. (5 marks)

13.(a) In the figure, AB // CD and $\alpha(\Delta ECD) : \alpha(ABDC) = 16 : 9$.

Find the numerical value of CD : AB.

Given that $\alpha(\Delta ECD) = 24\ \text{cm}^2$, calculate $\alpha(\Delta\ EAB)$.



(5 marks)

(b) The position vectors of the points A, B and C, relative to an origin O, are $2\hat{i} + 3\hat{j}$, $10\hat{i} + 2\hat{j}$ and $\lambda(-\hat{i} + 5\hat{j})$ respectively. Given that $|\overrightarrow{AB}| = |\overrightarrow{AC}|$, show that $\lambda^2 - \lambda - 2 = 0$ and hence find the two possible vectors $\overrightarrow{AC}$. (5 marks)

14.(a) If $\cot x + \cos x = p$ and $\cot x - \cos x = q$, show that $\sqrt{pq} = \cos x \cot x$, where x is acute and hence, prove that $p^2 - q^2 = 4\sqrt{pq}$. (5 marks)

(b) A man travels 10 km in a direction N 70° E and then 5 km in a direction N 40° E. What is his final distance and bearing from his starting point? (5 marks)

15.(a) If $y = (3 + 4x)e^{-2x}$, then prove that $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = 0$. (5 marks)

(b) Find the minimum value of the sum of a positive number and its reciprocal. (5 marks)