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) A function $f: R \longrightarrow R$ is given by $f(x)=4^{2-x}$. Which element of the domain has 64 as its image?

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

(2) A function $f: R \longrightarrow R$ is given by $f(x)=7-kx$ and $f^{-1}(5)=1$. Then $k=$

A. -1 B. 2 C. 1 D. -2 E. 4

(3) If x^3-3x^2+5 and x^3+5x^2+p have same remainder when divided by $x+1$, then $p=$

A. 7 B. -7 C. 13 D. -3 E. 3

(4) If $x+2$ is a factor of $f(x)=x^3-3x^2-ax+2$, then the value of a is

A. 9 B. -9 C. 1 D. -11 E. -1

(5) In the expansion of $(3-5z)^{14}$, the coefficient of z is

A. $3^{13}(\frac{70}{9})$ B. $3^{14}(\frac{-70}{9})$ C. $3^{14}(\frac{-70}{3})$ D. $3^{13}(\frac{-70}{3})$ E. $3^{14}(\frac{70}{9})$

(6) In the expansion of $\left(x^4-\frac{2}{x}\right)^{10}$, the term independent of x is

A. 11250 B. 12520 C. -11520 D. 11520 E. -11250

(7) The solution set in R of $-x^2-1 \geq 0$ is

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

(8) The sixth term of an A.P. is 21 and the sum of the first 17 terms is 0. The first term is

A. 42 B. -7 C. 7 D. -56 E. 56

(9) If 3^{2x+1}, 9^x and 243 are three consecutive terms of a G.P., then $x=$

A. 6 B. 7 C. 4 D. 3 E. 5

(10) If the $(m+n)$th term and $(m-n)$th term of a G.P. are p and q respectively, then the mth term of this G.P. is

A. $\sqrt{\frac{q}{p}}$ B. $\frac{3pq}{2}$ C. $\sqrt{pq}$ D. $\sqrt{\frac{p}{q}}$ E. pq

(11) If $K=\begin{pmatrix}1 & 1\\ 0 & 1\end{pmatrix}$, then $K^{2017}-K^{2016}+K^2$ is

A. K^5 B. K^3 C. K D. K^2 E. K^4

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(12) Let $A = \begin{pmatrix} 3^{x-2} & 6 \\ 9 & 5 \end{pmatrix}$. If $\det A = -9$, then $x =$

A. 2 B. –4 C. –2 D. 4 E. 0

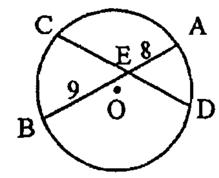
(13) If a die is rolled 60 times, then the expected frequency of not a prime number is

A. 30 B. 40 C. 10 D. 50 E. 20

(14) A coin is tossed two times. The probability of getting at least one tail is $x-2$, then x is

A. $\frac{3}{4}$ B. $\frac{11}{4}$ C. $\frac{15}{4}$ D. $\frac{9}{4}$ E. $\frac{1}{4}$

(15) In the figure, chord AB bisects chord CD at E. If AE= 8 and BE= 9, the length of CE is



A. $3\sqrt{2}$ B. $6\sqrt{3}$ C. $3\sqrt{3}$

D. $6\sqrt{2}$ E. none of these

(16) A pair of opposite angles of a cyclic quadrilateral are in the ratio 1:2. Then the larger angle has degree

A. 120° B. 100° C. 72° D. 60° E. 36°

(17) The lengths of two corresponding medians of two similar triangles are 6 and 9 respectively. If the area of the smaller triangle is 24,then the area of the larger triangle is

A. 36 B. 54 C. 72 D. 45 E. 63

(18) If $\vec{PQ} = -2\vec{QR}$, then which of the following is (are) true?

1. PQ = –2 QR, 2. P, Q, R are collinear. 3. R lies between P and Q.

A. 1 only B. 2 only C. 2 and 3 only D. 1 and 3 only E. 1, 2 and 3

(19) The map of $(-1, 4)$ by reflection in the X-axis is

A. (1, 4) B. (–1, –4) C. (4, 1) D. (–4, –1) E. none of these

(20) If $\sin x = \frac{12}{13}$ in the second quadrant, then $\sin 2x$ is

A. $\frac{120}{169}$ B. $\frac{60}{169}$ C. $\frac{25}{169}$ D. $\frac{-60}{169}$ E. $\frac{-120}{169}$

(21) Which of the following is (are) false?

1. If $f(x) = 1 + x^2, g(x) = \tan x$, then $f(g(x)) = \sec^2 x$.

2. $\tan\alpha + \cot\alpha = \frac{1}{\sin 2\alpha}$ 3. $\sin(\pi + x) = \sin x$

A. 1 only B. 2 only C. 1 and 2 only D. 2 and 3 only E. 1 and 3 only

(22) $\sin 120^\circ + \sin 60^\circ =$

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

(23) If $f(x) = 4x^2 + e^{-3x}$, then $f''(0) =$

A. –17 B. 8 C. 17 D. –8 E. –3

(24) The gradient of the curve $2xy^2 - x^3 = 3$ at the point $(1, -2)$ is

A. $\frac{-11}{8}$ B. $\frac{5}{8}$ C. $\frac{-5}{8}$ D. $\frac{-3}{8}$ E. $\frac{11}{8}$

(25) The curve $y = ax^2 - \frac{b}{x}$ has a stationary point at (1, 3), then the values of a and b is

A. 3, 6 B. 1, −2 C. −1, 2 D. −3, −6 E. none of these

(25 marks)

SECTION (B)

(Answer **ALL** questions)

2. Let $f : R \longrightarrow R$ and $g : R \longrightarrow R$ are defined by $f(x) = kx - 1$, where k is a constant and $g(x) = x + 12$. Find the value of k for which $(g \circ f)(2) = (f \circ g)(2)$.

(3 marks)

(OR)

If $x^3 + px^2 - 8qx + 5$ and $2x^3 - qx^2 + 4px - 18$ have a common factor $x - 2$, find the values of p and q.

(3 marks)

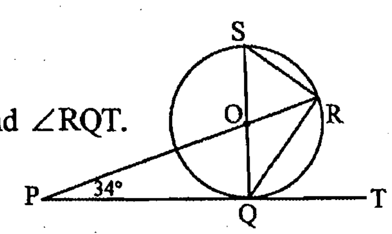
3. The pth term of an A.P. is q and the q th term of this A.P. is p. Show that its (p+ q)th term is zero. (3 marks)

(OR)

If the first term of a G.P. exceeds the second term by 2 and the sum of infinity is 50. Find the first term and the common ratio.

(3 marks)

4. In the figure, O is the centre of the circle, find $\angle RQT$.



(3 marks)

5. Prove that $\sin x + \sin 2x + \sin 3x = \sin 2x\,(1 + 2\cos x)$. (3 marks)

6. Calculate $\lim\limits_{x \to 2} \frac{x^3 - 8}{\sqrt{x+2} - 2}$ and $\lim\limits_{x \to 0} \frac{\cos x - 1}{\sin^2 x}$. (3 marks)

SECTION (C)

(Answer any **SIX** questions)

7.(a) Functions f and g are defined by $f : x \mapsto \frac{x}{x-3}, x \neq 3$, $g : x \mapsto 3x + 5$. Find the value of x, for which $(f \circ g)^{-1}(x) = \frac{5}{3}$. (5 marks)

(b) A binary operation $\odot$ on R is defined by $x \odot y = y^x + 2x^y y^x - x^y$. Evaluate $(2 \odot 1) \odot 1$. (5 marks)

8.(a) If $x + 2$ is a factor of $x^3 - ax - 6$, then find the remainder when $2x^3 + ax^2 - 6x + 9$ is divided by $x + 1$. (5 marks)

(b) In the expansion $(1+x)^a + (1+x)^b$, the coefficients of x and x^2 are equal for all positive integers a and b, prove that $3(a+b) = a^2 + b^2$. (5 marks)

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9.(a) Find the solution set in R of $-7+(2x+1)^2 \geq 6x$ by algebraic method and illustrate it on the number line. (5 marks)

(b) If b, x, y, c are consecutive terms of a G.P. and the A.M. between b and c is a, then prove that $x^3+y^3=2abc$. (5 marks)

10.(a) The product of first three terms of a G.P is 1000. If we add 6 to its second term, 7 to its third term and its first term is not changed, then three terms form an A.P. Find the first three terms of the G.P. (5 marks)

(b) Given that $A=\begin{pmatrix}4 & 1\\ -9 & -2\end{pmatrix}$ and $B=\begin{pmatrix}-3 & 1\\ -1 & 2\end{pmatrix}$. Solve the equation $AX=2B-A^2$.

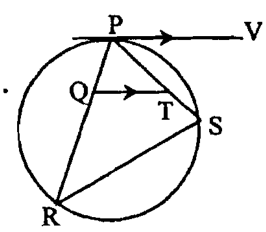
(5 marks)

11.(a) Find the inverse of the matrix $\begin{pmatrix}1 & 1\\ -1 & 1\end{pmatrix}$ and use it to solve the following system of equations, $y-x=1$ and $x+y=3$. (5 marks)

(b) Draw a tree diagram to list all possible outcomes for a family which has three children. Find the probability that (i) only the first child is a boy (ii) the last child is a boy (iii) the last two children born are boys. (5 marks)

12.(a) Two unequal circles are tangent internally at A; BC, a chord of the larger circle, is tangent to the smaller circle at D; prove that AD bisects $\angle BAC$. (5 marks)

(b) PV is a tangent to the circle and QT is parallel to PV. Prove that QRST is a cyclic quadrilateral.



(5 marks)

13.(a) In ΔABC, AD and BE are altitudes to the sides BC and AC respectively. If $\angle ACD=45^\circ$, prove that $\alpha(\Delta DEC):\alpha(\Delta ABC)=1:2$. (5 marks)

(b) The coordinates of P, Q and R are (1, 3), (5, 4) and (1, 9) respectively. Find the coordinates of S if PQRS is a parallelogram. (5 marks)

14.(a) Prove the identity $\sec 2\alpha=\dfrac{1+\tan^2\alpha}{2-\sec^2\alpha}$. (5 marks)

(b) A town P is 50 km away from a town Q in the direction N 35° E and a town R is 68 km from Q in the direction N 42° 12′ W. Calculate the distance and bearing of P from R. (5 marks)

15.(a) Find the equation of the tangent line to the curve $x^3+y^3-9xy=0$ at the point (3, 2).

(5 marks)

(b) Find the two positive numbers whose sum is 82 and whose product is as large as possible. (5 marks)