2019

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 $f(x) = x + 1$, and $g(x) = 2x^2 - x + 3$. Find the values of x which satisfy the equation $(f \circ g)(x) = 4x + 1$. (3 marks)

(b) The expression $2x^2 + 5x - 3$ leaves a remainder of $2p^2 - 3p$ when divided by $2x - p$. Find the values of p. (3 marks)

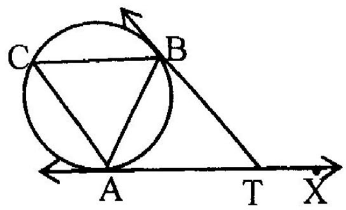
2.(a) Find and simplify the coefficient of x^7 in the expansion of $(x^2 + \frac{2}{x})^8$, $x \neq 0$. (3 marks)

(b) Find the sum of all even numbers between 69 and 149. (3 marks)

3.(a) The matrices $A = \begin{pmatrix} 2 & 0 \\ 0 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} x & y \\ 0 & z \end{pmatrix}$ are such that $AB = A + B$. Find the values of x, y and z. (3 marks)

(b) A die is thrown. If the probability of getting a number not less than x is $\frac{2}{3}$, find x. (3 marks)

4.(a) AT and BT are tangents to the circle ABC at A and B. Prove that $\angle BTX = 2\angle ACB$. (3 marks)



(b) The coordinates of A, B and C are (1, 0), (4, 2) and (5, 4) respectively. Use vector method to determine the coordinates of D if ABCD is a parallelogram. (3 marks)

5.(a) Solve the equation $2 \cos x \sin x = \sin x$ for $0^\circ \leq x \leq 360^\circ$. (3 marks)

(b) Differentiate $x^3 + 2x$ with respect to x from the first principles. (3 marks)

SECTION (B)

(Answer any **FOUR** questions)

6.(a) The functions f and g are defined by $f(x) = 2x - 1$ and $g(x) = 4x + 3$. Find $(g \circ f)(x)$ and $g^{-1}(x)$ in simplified form. Show also that $(g \circ f)^{-1}(x) = (f^{-1} \circ g^{-1})(x)$. (5 marks)

(b) The expression $ax^3 - x^2 + bx - 1$ leaves the remainders of -33 and 77 when divided by $x + 2$ and $x - 3$ respectively. Find the values of a and b, and the remainder when divided by $x - 2$. (5 marks)

7.(a) A binary operation $\odot$ on R is defined by $x \odot y = (3y - x)^2 - 8y^2$. Show that the binary operation is commutative. Find the possible values of k such that $2 \odot k = -31$. (5 marks)

(b) If the coefficients of x^r and x^{r+2} in the expansion of $(1 + x)^{2n}$ are equal, show that $r = n - 1$. (5 marks)

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8.(a) Find the solution set in R of the inequation $x^2 - 3x + 2 \le 0$ by algebraic method and illustrate it on the number line. (5 marks)

(b) Find the sum of the first 12 terms of the A.P. 44, 40, 36, ... Find also the sum of the terms between the 12^{th} term and the 26^{th} term of that A.P. (5 marks)

9.(a) The sum of the first n terms of a certain sequence is given by $S_n = 2^n - 1$. Find the first 3 terms of the sequence and express the n^{th} term in terms of n. (5 marks)

(b) Using the definition of inverse matrix, find the inverse of the matrix $\begin{pmatrix} 3 & 1 \\ 2 & 1 \end{pmatrix}$. (5 marks)

10.(a) Find the inverse of the matrix $\begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$. Use it to determine the coordinates of the point of intersection of the lines $5x + 6y = 7$ and $8y + 7x = 10$. (5 marks)

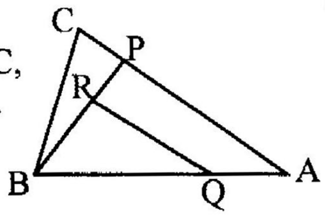
(b) Construct the table of outcomes for rolling two dice. Find the probability of an outcome in which the score on the first die is less than that on the second die. Find also the probability that the score on first die is prime and the score on the second is even. (5 marks)

SECTION (C)

(Answer any **THREE** questions)

11.(a) PT is a tangent and PQR is a secant to a circle. A circle with T as centre and radius TQ meets QR again at S. Prove that $\angle RTS = \angle RPT$. (5 marks)

(b) In the diagram, P is the point on AC such that AP = 3PC, R is the point on BP such that BR = 2RP and QR // AC. Given that $\alpha(\Delta BPA) = 36\ cm^2$, calculate $\alpha(\Delta BPC)$ and $\alpha(\Delta BRQ)$. (5 marks)



12.(a) Prove that the quadrilateral formed by producing the bisectors of the interior angles of any quadrilateral is cyclic. (5 marks)

(b) If $\alpha + \beta + \gamma = 180°$, prove that $\tan\frac{\alpha}{2}\tan\frac{\beta}{2} + \tan\frac{\beta}{2}\tan\frac{\gamma}{2} + \tan\frac{\alpha}{2}\tan\frac{\gamma}{2} = 1$. (5 marks)

13.(a) In ΔABC, if $\angle B = \angle A + 15°$, $\angle C = \angle B + 15°$ and BC = 6, find AC. (5 marks)

(b) If $y = \ln(\sin^3 2x)$, then prove that $3\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 + 36 = 0$. (5 marks)

14.(a) In the quadrilateral ABCD, M and N are the midpoints of AC and BD respectively. Prove that $\vec{AB} + \vec{CB} + \vec{AD} + \vec{CD} = 4\vec{MN}$. (5 marks)

(b) Find the normals to the curve $xy + 2x - y = 0$ that are parallel to the line $2x + y = 0$. (5 marks)