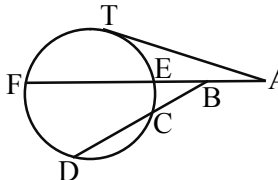


**2019 SAMPLE QUESTION**  
**MATRICULATION EXAMINATION**  
**DEPARTMENT OF MYANMAR EXAMINATION**  
**MATHEMATICS** **Time Allowed: (3) Hours**  
**WRITE YOUR ANSWERS IN THE ANSWER BOOKLET.**

**SECTION (A)**

(Answer ALL questions)

- 1.(a) Given that  $f(x) = 3x - 4$ ,  $g(x) = x^2 - 1$ . Find the values of  $x$  which satisfy the equation  $(g \circ f)(x) = 9 - 3x$ . (3 marks)
- (b) When  $f(x) = (x + 2)^3(x - 1) - px + 6$  is divided by  $x + 3$ , the remainder is 28. Find the value of  $p$  and hence show that  $x - 1$  is a factor of  $f(x)$ . (3 marks)
- 2.(a) The coefficient of  $x^3$  in the expansion of  $(1 + \frac{x}{2})^n$  is 7, find the value of  $n$ . (3 marks)
- (b) Find  $n$ , if  $1 + 3 + 3^2 + 3^3 + \dots + 3^n = 121$ . (3 marks)
- 3.(a) Find two matrices of the form  $X = \begin{pmatrix} x & 1 \\ 0 & y \end{pmatrix}$  such that  $X^2 = I$ . (3 marks)
- (b) Two balls are drawn at random at the same time from a box containing 3 red balls and 8 white balls. Find the probability that both balls will be white. (3 marks)
- 4.(a) In the figure  $AT$  is a tangent segment;  $ABEF$  and  $BCD$  are straight lines. If  $AT = 6$  cm,  $AB = BE = 2$  cm,  $BC = 3$  cm, then find  $EF$  and  $CD$ . (3 marks)
- 
- (b) The coordinates of  $A$ ,  $B$  and  $C$  are  $(1, 2)$ ,  $(7, 1)$  and  $(-3, 7)$  respectively. If  $O$  is the origin and  $\vec{OC} = h \vec{OA} + k \vec{OB}$ , where  $h$  and  $k$  are constants, find the value of  $h$  and of  $k$ . (3 marks)
- 5.(a) In  $ABC$ ,  $\angle A : \angle B : \angle C = 3 : 4 : 5$  and  $AC = \sqrt{6}$ , find  $BC$ . (3 marks)
- (b) Given that the gradient of the curve  $y = x^2 + ax + b$  at the point  $(2, -1)$  is 1. Find the values of  $a$  and  $b$ . (3 marks)

**SECTION (B)**

(Answer any **FOUR** questions)

- 6.(a) Functions  $f : \mathbb{R} \rightarrow \mathbb{R}$  and  $g : \mathbb{R} \rightarrow \mathbb{R}$  are defined by  $f(x) = x + 7$  and  $g(x) = 3x - 1$ . Find the value of  $x$  for which  $(g^{-1} \circ f)(x) = (f^{-1} \circ g)(x) + 8$ . (5 marks)
- (b) Given that  $x^3 - 2x^2 - 3x - 11$  and  $x^3 - x^2 - 9$  have the same remainder when divided by  $x + a$ , determine the values of  $a$  and the corresponding remainders. (5 marks)

**[P.T.O.]**

- 7.(a) Let  $J^+$  be the set of all positive integers. A binary operation on the set  $J^+$  is defined by  $a \odot b = a^2 + ab + b^2$ . Prove that the binary operation is commutative.  
Find the value of  $x$  such that  $2 \odot x = 12$ . (5 marks)
- (b) If the coefficient of  $x^2$  in the expansion of  $(2x + k)^6$  is equal to the coefficient of  $x^5$  in the expansion of  $(2 + kx)^8$ , find  $k$ . (5 marks)
- 8.(a) Find the solution set in  $R$  of the inequation  $x^2 - 4x \leq 0$  by algebraic method and illustrate it on the number line. (5 marks)
- (b) The four angles of a quadrilateral are in A.P. Given that the value of the largest angle is three times the value of the smallest angle, find the values of all four angles. (5 marks)
- 9.(a) Given that 8,  $p$  and  $q$  are three consecutive terms of an A.P. while  $p$ ,  $q$  and 36 are three consecutive terms of a G.P., find the possible values of  $p$  and  $q$ . (5 marks)
- (b) Given that  $D = \begin{pmatrix} 2 & -3 \\ -2 & 1 \end{pmatrix}$  and that  $D^2 - 3D - kI = O$ , find the value of  $k$ . (5 marks)
- 10.(a) Given that  $A = \begin{pmatrix} 3 & 1 \\ 2 & 1 \end{pmatrix}$  and  $B = \begin{pmatrix} 2 & 5 \\ -1 & -3 \end{pmatrix}$ , write down the inverse matrix of  $A$ .  
Use your result to find the matrix  $Q$  such that  $QA = B$ . (5 marks)
- (b) How many 3 digit numerals can you form from 1, 5 and 7, without repeating any digit?  
Find the probability of a numeral which begins with 1. (5 marks)

### SECTION (C)

(Answer any **THREE** questions)

- 11.(a) OA and OB are two radii of a circle meeting at right angle. From A and B, two parallel chords AX, BY are drawn. Prove  $AY \perp BX$ . (5 marks)
- (b) Given ABCD is a trapezium in which  $AB \parallel DC$  and  $\angle ADB = \angle C$ .  
Prove that  $AD^2 : BC^2 = AB : CD$ . (5 marks)
- 12.(a) From any point D on the base BC of  $\triangle ABC$  a line is drawn meeting AB at E and such that  $\angle BDE = \angle A$ . Prove that  $BE \cdot BA = BD \cdot BC$ . (5 marks)
- (b) Express  $\cos 3x$  in terms of  $\cos x$ . (5 marks)
- 13.(a) Solve  $\triangle ABC$ , with  $BC = 3$ ,  $AC = 4$ ,  $AB = 6$ . (5 marks)
- (b) Given that  $y = \cos^2 x$ , prove that  $\frac{d^2 y}{dx^2} + 4y = 2$ . (5 marks)
- 14.(a) If a piece of string of fixed length is made to enclose a rectangle, show that the enclosed area is the greatest when the rectangle is a square. (5 marks)
- (b) OPRQ is a parallelogram and OP is produced to S such that  $\vec{OS} = 3\vec{OP}$ . If X is a point on PR such that  $\vec{PX} = 2\vec{XR}$ , show that the points Q, X and S are collinear. (5 marks)