

Alternative No:

Index No:

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Supervising Examiner's/  
Invigilator's initial:

**Mathematics**

**Writing Time: 2½ hours**

**Total Marks : 80**

**READ THE FOLLOWING DIRECTIONS CAREFULLY.**

- Do not** write for the first **fifteen minutes**. This time is to be spent reading the questions. After having read over the questions, you will be given **two and a half hours** to answer all questions.
- Write your **index number** in the space provided on the **top right hand corner of this cover page only**.
- In this paper, there are **two sections**: Section A and Section B. You are expected to answer **ALL** the questions in Section A and any **FOUR** questions from Section B. The intended marks for a question or its parts are stated in the brackets.
- Read the directions to each question carefully and write **all** your answers in the space provided in the **question booklet** itself.
- Remember to write **quickly** but **neatly**.
- You are not allowed to remove any page from this booklet.
- Do not** leave the examination hall before you have made sure that you have answered all the required number of questions.

*For Chief Marker's and Markers' Use Only*

Section	A						B							Chief Marker's initial	
Question	1	2	3	4	5	6	7	8	9	10	11	12	13		Total
Award															
Markers' initial															



**SECTION A (40 Marks)**

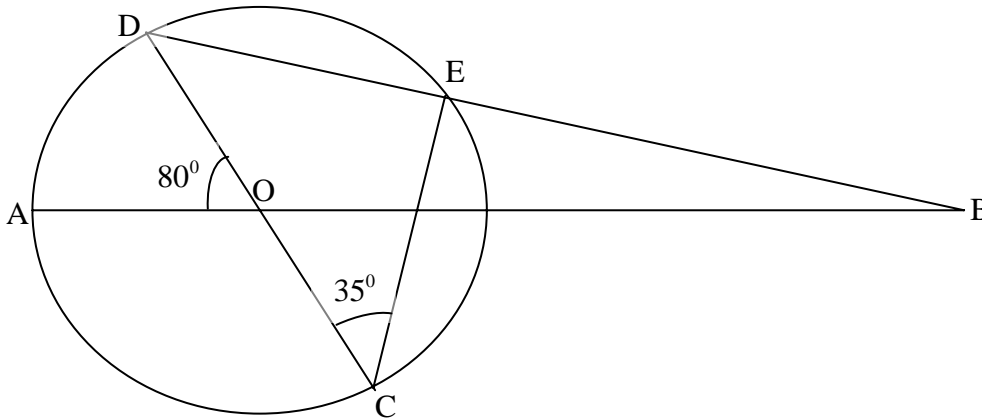
**Answer ALL questions in this section**

**Question 1**

- (a) The sale of a washing machine including sales tax is Nu. 13,500. If the list price of the set is Nu. 12,500, then find the rate of sales tax. [2]

- (b) If  $(x-1)$  is a factor of  $x^3 - px^2 - 3x + 2 = 0$  find  $p$ . [2]

- (c) In the figure, the lines  $AB$  and  $CD$  pass through the centre  $O$  of the circle. If  $\angle OCE = 35^\circ$  and  $\angle AOD = 80^\circ$ , then



find

(i)  $\angle CDE$ .

(ii)  $\angle OBE$ .

[1]

### Question 2

(a) Name the geometrical figures described by the following statements. [2]

(i) A quadrilateral which has no lines of symmetry.

(ii) A quadrilateral having only its diagonals as lines of symmetry.

(b) The diameter of a road roller 2 m long is 1.4 m. Calculate the area of the road covered when the road roller makes one revolution. [2]

- (c) Evaluate  $\frac{\cos 35^\circ}{\sin 55^\circ} + \sin^2 20^\circ + \sin^2 70^\circ + \cos 0^\circ$  without using tables. [2]

### Question 3

- (a) Find the equation of the line which is parallel to the line  $3x - 2y = 8$  and passes through the point  $(-1, 2)$ . [2]

- (b) The marks obtained by 100 students in six papers of an examination are given below:

Marks	Number of Students
0-100	5
100-200	10
200-300	15
300-400	40
400-500	20
500-600	10

Draw a histogram of the given data on graph paper and estimate the mode.

[4]

- (c) The marks obtained by a set of students in an examination are given below:

Marks	Frequency	$fx$
5	6	
10	2	
15	5	
20	$x$	
25	3	

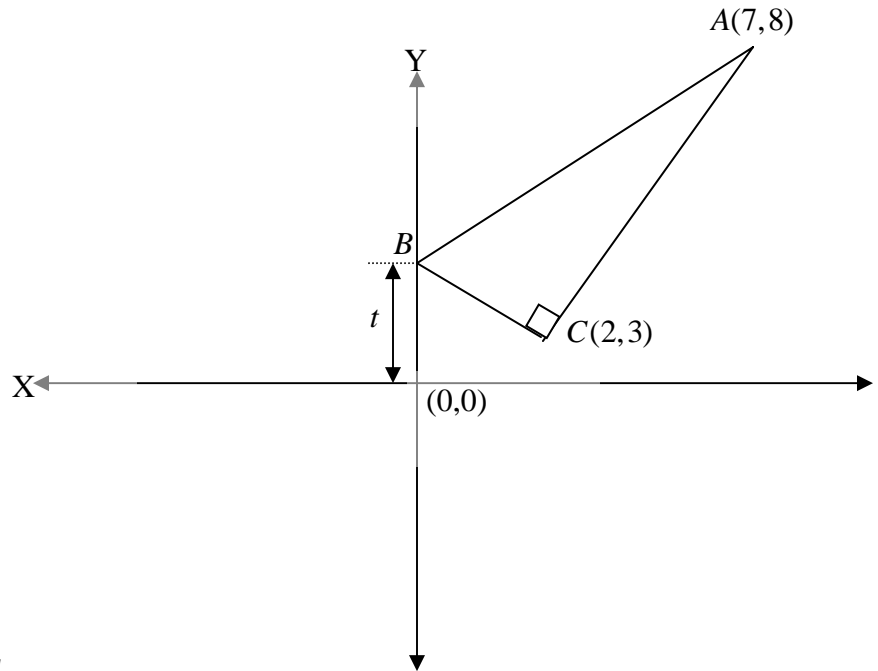
Given that the mean mark of the set of students is 15, calculate the numerical value of  $x$ .

[2]

**Question 4**

In the figure,  $AC$  is perpendicular to  $BC$ . Coordinates of  $A$  and  $C$  are  $(7, 8)$  and  $(2, 3)$  respectively. Point  $B$  is lying on  $Y$  axis.

[3]



Find

- (i) slope of  $AC$ .

(ii) slope of  $BC$  in terms of  $t$ .

(iii) coordinates of  $B$ .

(b) If  $A = \begin{bmatrix} 4 & 1 \\ -1 & 2 \end{bmatrix}$ , then find the value of  $6A - A^2$ .

[2]



- (c) Find the ratio in which the point  $(4, 1)$  divides the line joining the points  $A(3, 2)$  and  $B(6, -1)$ . [2]

**Question 5**

- (a) A function  $f$  is defined by  $f = \left\{ (x, y) : x, y \in N, y = x + \frac{4}{x} \text{ and } x < 6 \right\}$ .  
List the set of ordered pairs of  $f$ . [2]

- (b) If  $2 \sin^2 \theta = 1$ , where  $\theta$  is an acute angle, then find  
(i) the value of  $\theta$ .

[1]

- (ii)  $\tan^2 \theta + \cos^2 \theta$ .

[1]

(c) Prove that  $\tan \theta + \cot \theta = \sec \theta \operatorname{cosec} \theta$ .

### Question 6

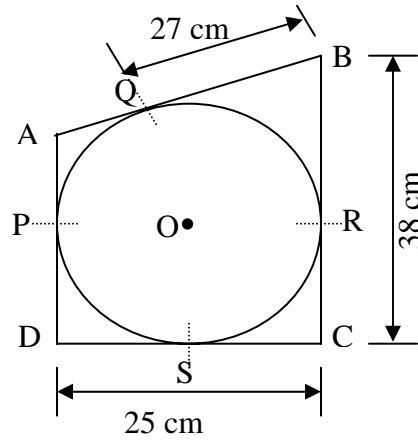
(a) Given below are the entries in a Savings Bank Account pass book:

Date	Particulars	Amount Withdrawn	Amount Deposited	Balance
3 <sup>rd</sup> March	B/F	-	-	9000.00
9 <sup>th</sup> March	To self	5000.00	-	4000.00
18 <sup>th</sup> March	By cash	-	7000.00	11000.00
20 <sup>th</sup> March	By cash	-	3000.00	14000.00
5 <sup>th</sup> July	By cash	-	1000.00	15000.00
10 <sup>th</sup> July	To cheque	5000.00	-	10000.00

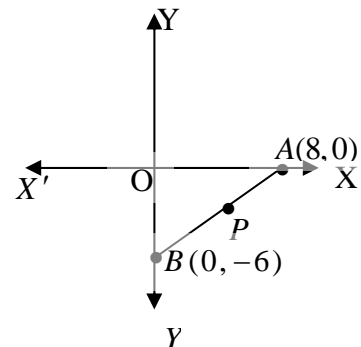
Calculate the interest for five months from March to July at 6% p.a. on minimum balance after the 10<sup>th</sup> of each month.

[3]

- (b) In the figure a circle is inscribed in the quadrilateral  $ABCD$ . Given that  $BC = 38$  cm,  $QB = 27$  cm and  $DC = 25$  cm and that  $AD$  is perpendicular to  $DC$ . Find the radius of the circle.



- (c) In the figure,  $P$  is the mid-point of  $AB$  and  $O$  is the origin.



Find

(i) coordinates of  $P$ .

[1]

(i) distance  $OP$ .

[1]

**SECTION B (40 marks)**

**Attempt any *FOUR* questions from this section.**

**Question 7**

- (a) Mr. Tashi's annual salary is Nu.144,000. His monthly contribution towards Provident Fund is Nu. 300 and he pays Nu. 200 per month to the RICB for his life insurance policy. He donates Nu.200 to a Charity (Obtain 50% tax relief).

Table of Income Tax Slab

Up to Nu. 10,000	Nil
Nu. 100000- Nu.150,000	Nu. 2,000+20% of amount exceeding Nu.100,000
More than Nu.150,000	Nu. 4,000+ 20% of amount exceeding Nu. 150,000

Standard Deduction: Nu. 2,500.

Tax Rebate: 20% of rebate amount to maximum Nu. 8,000.

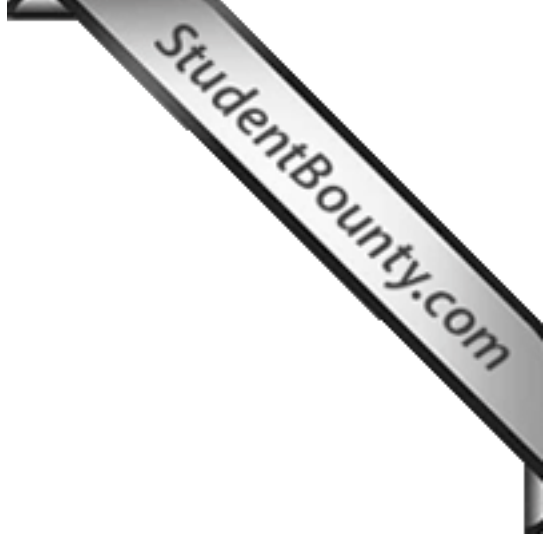
Calculate

- (i) the taxable income.

[1]

- (ii) the amount admissible for tax rebate.

[1]



(iii) tax rebate.

(iv) the net tax payable by Tashi.

[1]

(b) Show that “is parallel to” on a set of lines is an Equivalence relation.

[3]

- (c) Mr. Karma purchased 500 shares of Nu. 100 at Nu. 150. The company declares a dividend of 12% by the end of the year.

Calculate

- (i) the money invested by Mr. Karma to buy those shares.

[1]

- (ii) Mr. Karma's annual dividend.

[1]

- (iii) Mr. Karma's percent of return on the investment.

[1]



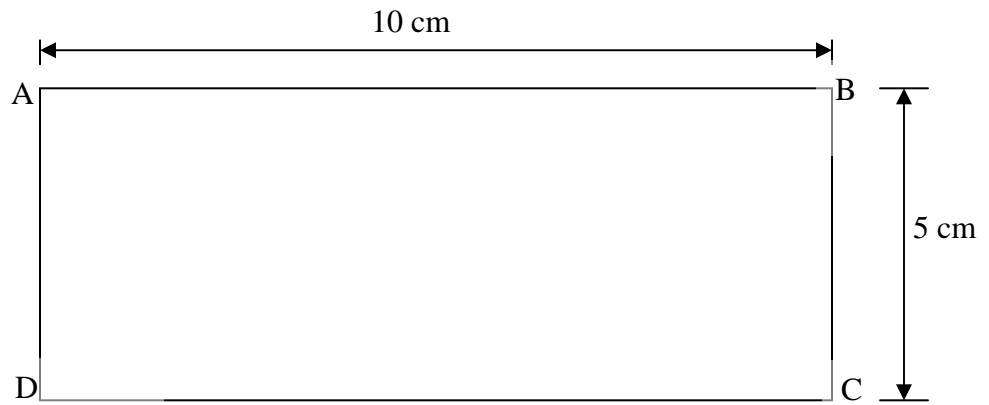
**Question 8**

(a) Draw two circles of radius 3 cm and 2 cm with their centres 7 cm apart. [1]

(i) Construct the direct common tangents to the circle drawn in (a). [2]

(ii) Measure and write the length of the tangent. [1]

- (b) The figure  $ABCD$ , is the map of a rectangular park. Locate a point  $P$  which is equidistant from the side  $AB$  and the diagonal  $AC$ . Also the point  $P$  is equidistant from the corners  $D$  and  $C$  respectively.



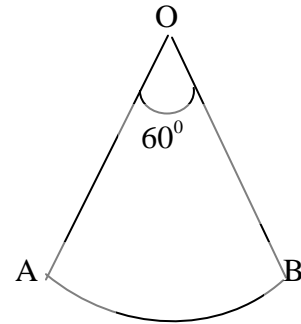
- (i) Find by construction the location of the point  $P$ .

[2]

- (ii) What is the shortest distance of the location of the point  $P$  from the side  $AB$ .

[1]

- (b) The perimeter of the figure given below is 64 cm. If  $\angle AOB = 60^\circ$ , then calculate



(i) the length of  $OA$ .

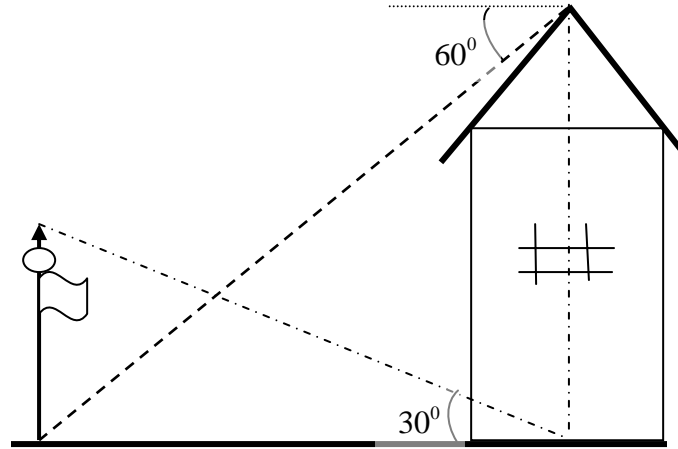
[2]

(ii) the area of the sector.

[1]

**Question 9**

- (a) In the diagram given below, the angle of elevation of the top of a flag pole from the bottom of a building is  $30^\circ$  and the angle of depression to the bottom of the flag pole from the top of the building is  $60^\circ$ . If the height of the flag pole is 10 m, then



find

- (i) the distance between the pole and the building.

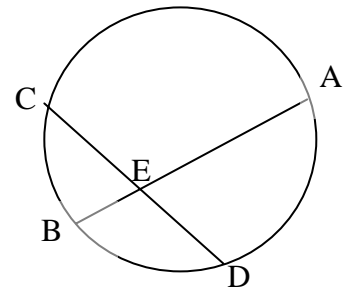
[2]

- (ii) the height of the building.

[1]

- (b) In the figure, the chords  $AB$  and  $CD$  of the circle intersect at  $E$ .  
 Given  $CD=12$  cm,  $AB=18$  cm and  $EA= 16$  cm, calculate  $CE$ .

[3]



- (c) The table below gives the marks scored by 100 students in an examination.

Marks	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
Number of Students	4	10	15	20	14	12	10	6	5	4

Calculate the mean mark.

[4]

**Question 10**

(a) Find the area of the semi-circular protractor whose diameter is 14 cm.

[2]

- (b) (i) Plot  $P(0,3)$  and  $Q(2,5)$  on the graph paper.  
(ii) Plot  $Q'$  on the same graph paper where  $Q'$  the image of  $Q$  under reflection in  $X$  axis.  
(iii) Plot the image of  $P'$  of  $P$  under reflection in the line  $QQ'$ .  
(iv) Write down the coordinates of  $P'$ . [3]

- (c) A dividend of 9% was declared on Nu. 100 shares selling at a certain price. If the rate of return was 5%, then calculate the market value of the share. [2]

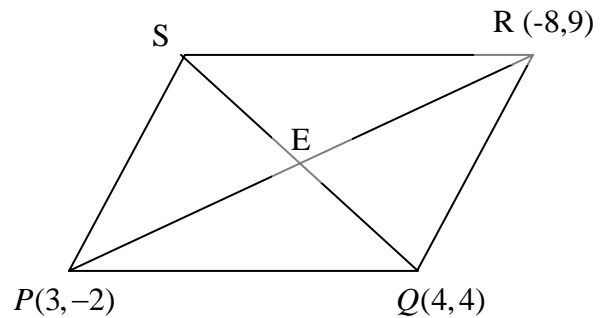
- (d) Draw a circle of radius 2.5 cm. Mark a point  $P$  on the circle. Construct a tangent through  $P$ . State the theorem used in the construction. [3]

**Question 11**

- (a) In the beginning of the year in a class, it was found that the number of students sitting on each bench and the number of benches were same. After one week, some new students were admitted. Now the strength of the students became double. If the class was given four more benches and the number of students sitting on each bench was same as before, calculate the number of students in the class in the beginning of the year.

**[4]**

- (b)  $P(3, -2), Q(4, 4), R(-8, 9)$  are the three vertices of a parallelogram. Calculate





(i) coordinates of  $E$ .

(ii) coordinates of  $S$ .

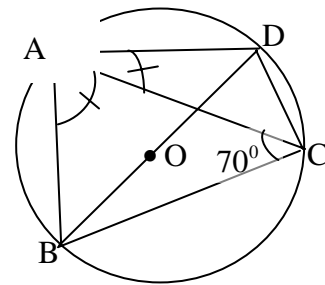
[3]

(c) The average diameter of a certain number of domas (areca nut) which are spherical in shape is 1.4 cm. Wangmo immersed some of the domas into the water contained in a cylindrical bucket of diameter 28 cm. Find how many domas were immersed into the water when the water level rose to a height of 2.1 cm.

[3]

**Question 12**

- (a) In the figure,  $O$  is the centre of the circle,  $AC$  bisects  $\angle A$ . If  $\angle ACB = 70^\circ$ . [4]



Find

- (i)  $\angle BAD$ .

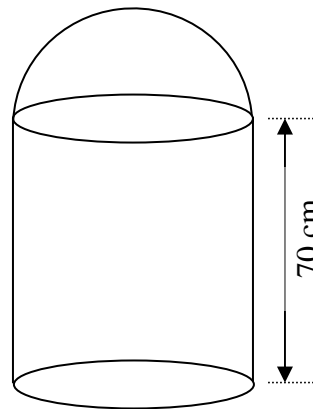
- (ii)  $\angle ABC$ .

(iii)  $\angle BCD$ .

(iv)  $\angle ADC$ .

- (b) In accordance with the figure given at the right, a metal container in the form of a cylinder is surmounted by a hemisphere of the same radius. The height of the cylinder is 70 cm and the radius of the base is 35 cm. Calculate the area of the metal used ( Excluding the base).

[2]



- (c) Use graph paper to solve the quadratic equation  $y = x^2 + 2x - 3$ .  
(Take 1 cm = 1 unit for both the axes).

[4]

**Question 13**

- (a) Given  $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} X = \begin{bmatrix} 7 \\ 3 \end{bmatrix}$ , where  $X$  is a matrix.

[3]

- (i) Write down the order of matrix  $X$ .

- (ii) Find the matrix  $X$ .

(b) A chord is 5 cm away from the centre of a circle. If the radius of the circle is 13 cm, then calculate the length of the chord. [3]

(c) The wheel of a cart is making 5 revolutions per second. If the diameter of the wheel is 84 cm, then find its speed in km/hr. [2]

(d) Prove that  $(\cos A + \sin A)^2 + (\cos A - \sin A)^2 = 2$ .

[2]

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