GREENWOOD HIGH
TERM EXAMINATION – 1
SEPTEMBER 2019
SUBJECT – MATHEMATICS

Grade: 10
Date: 16/09/19

Time: 2½ Hours
Max. Marks: 80

Answer to this paper must be written on the paper provided separately.
*You will **NOT** be allowed to write during the first 15 minutes.*
This time is to be spent in reading the question paper.
The time given at the head of this paper is the time allowed for writing the answers.

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*Attempt **all** questions from **Section A**, and **any four** from **Section B**.*
All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer. Omission of essential working will result in the loss of marks.
The intended marks for questions or parts of questions are given in the brackets [ ].

SECTION A [40 Marks]

*(Attempt **all** questions from this Section)*

Question 1

(a) Prove that: $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$ [3]

(b) Solve the following inequation. Write the solution set and represent it on the number line:
$\frac{1}{2}(2x-1) < 2x + \frac{1}{2} \leq 5\frac{1}{2}$ where $x \in R$. [3]

(c) Find x and y, if $\begin{bmatrix} -2 & 0 \\ 3 & 1 \end{bmatrix}\begin{bmatrix} y+1 & 0 \\ 3x & 2x-y \end{bmatrix} + 3\begin{bmatrix} -2 & 0 \\ 3 & -1 \end{bmatrix} = \begin{bmatrix} -x & 0 \\ -9 & -2 \end{bmatrix}$ [4]

Question 2

(a) Using factor theorem show that $(x-2)$ is a factor of, the polynomials $x^3 + x^2 - 4x - 4$. Hence, factorise the polynomial completely. [3]

(b) The median of the following observations 11, 12, 14, $(x-2)$, $(x+4)$, $(x+9)$, 32, 38, 47 arranged in ascending order is 24. Find the value of x and hence find the mean. [3]

(c) In an Arithmetic Progression, the fifth and eighth terms are 8 and 17 respectively. Find the: [4]

(i) first term
(ii) common difference
(iii) sum of first 30 terms

Question 3

(a) Tickets numbered 3, 5, 7, 9, …., 29 are placed in a box and mixed thoroughly. One ticket is drawn at random. Find the probability that the number on the ticket is:

(i) a prime number **(ii)** a number less than 15 **(iii)** a number divisible by 3 [3]

(b) Mr Johnson has a recurring deposit account in a bank for 3½ years at 9.5% per annum. If he gets Rs 78,638 at the time of maturity, find:

(i) the monthly instalment. **(ii)** the total interest earned [3]

(c) The line joining A (– 4, 1) and B (17, 10) is divided by point P in the ratio 1 : 2. [4]

(i) Write down the coordinates of the point P.

(ii) Calculate the distance OP where O is the origin.

(iii) In what ratio does the y-axis divide the line AB?

Question 4

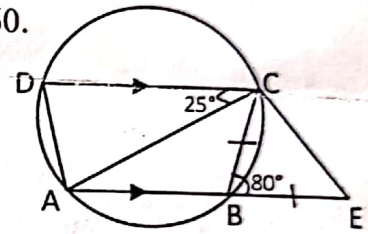
(a) A dividend of 12% was declared on Rs.100 shares selling at certain price. If the rate of return is 7.5%, calculate:

(i) the market value of the share.

(ii) the amount to be invested to obtain an annual dividend of Rs.1260. [3]

(b) In the figure, AB is parallel to DC, $\angle$ CBE = 80°, $\angle$ ACD = 25° and BC = BE. Find:

(i) $\angle$ CEB **(ii)** $\angle$ ADC **(iii)** $\angle$ ADB [3]



(c) Draw a histogram from the following distribution and estimate the mode from the graph. Use the scale of 2 cm = 5 units in both the axes [4]

Class Interval	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30
Frequency	10	14	28	42	50	30

SECTION B [40 Marks]

(Attempt any four questions from this Section)

Question 5

(a) Solve for x the quadratic equation $2x^2 - 7x - 1 = 0$. Give the answer correct to two decimal places. [3]

(b) Prove that $(\text{cosec}\,\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta) = 1$ [3]

(c) Use graph paper for this question: Plot the points A (1, 1), B (5, 1), C (4, 2) and D (2, 2).

(i) Reflect A, B, C, and D on x-axis to A′, B′, C′ and D′ respectively and write the coordinates.

(ii) Name the figure CDAA′D′C′B′B.

(iii) Write the co-ordinates of the reflection of ABCD in the origin to A″B″C″D″.

(iv) What single reflection will transform A′B′C′D′ to A″B″C″D″ ? [4]

Question 6

(a) What number should be added to $2x^3 - 3x^2 - 8x$ such that the resulting polynomial leaves the remainder 10 when divided by $2x + 1$? [3]

(b) If $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1$ and $\frac{x}{a}\sin\theta - \frac{y}{b}\cos\theta = 1$ then find $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ [3]

(c) Point A has coordinate $(6, -4)$ and point B has y-intercept 8 units. Find:

(i) the slope of AB.

(ii) the equation of the right bisector of the line segment AB.

(iii) the value of p if $(-1, p)$ lies on it. [4]

Question 7

(a) The first and last term of a Geometrical Progression (G.P.) are 3 and 96 respectively. If the common ratio is 2, find: [3]

(i) the numbers of terms **'n'** of the G.P. **(ii)** Sum of the **n** terms.

(b) Find the value of **k** for which the following equations has real and equal roots.

$(k - 12)x^2 + 2(k - 12)x + 2 = 0$ [3]

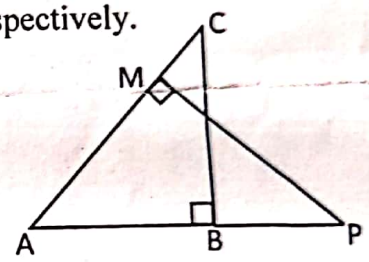
(c) In the given figure, Δ ABC and Δ AMP are right angled at B and M respectively. [4]

Given AC = 10 cm, AP = 15 cm and PM = 12 cm.

(i) Prove that Δ ABC $\sim$ Δ AMP.

(ii) Find AB and BC.

(iii) Find ar(Δ ABC) : ar(Δ AMP)



Question 8

(a) Two trains leave a railway station at the same time. The first train travels due west and the second train due north. The first train travels at 5 km/h faster than the second train. If after 2 hours, they are 50 km apart, find the average speed of each train. [3]

(b) The model of a ship is made to a scale of 1 : 200.

(i) The length of the model is 3 m. Calculate the length of the ship.

(ii) The area of the deck of the ship is 90000 sq m. Find the area of the deck of the model.

(iii) The volume of the model is 150 litres, Calculate the volume of the ship in cubic metre. [3]

(c) The following table gives the wages of workers in a factory:

Wages in Rs.	45 – 50	50 – 55	55 – 60	60 – 65	65 – 70	70 – 75	75 – 80
No. of workers	5	8	30	25	14	12	6

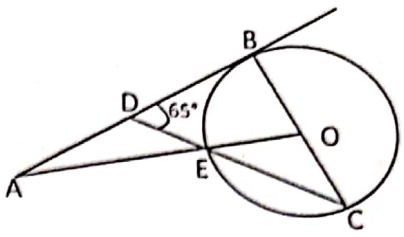
Calculate the mean by short-cut method. [4]

Question 9

(a) If a, b and c are in continued proportion, then prove that:

$$\frac{1}{a^3}+\frac{1}{b^3}+\frac{1}{c^3}=\frac{a}{b^2c^2}+\frac{b}{c^2a^2}+\frac{c}{a^2b^2}$$ [3]

(b) In the figure, O is the centre of the circle and AB is a tangent to it at point B.
$\angle BDC = 65°$. Find $\angle BAO$ and $\angle BOA$.



[3]

(c) Mr Amit sold some Rs 20 shares paying 8% dividend at Rs 18 and invested the proceeds in Rs 10 shares paying 12% dividend at 50% premium. If the change in his annual income is Rs 360, find the number of shares sold by Mr Amit. [4]

Question 10

(a) An aeroplane when 3000 m high passes vertically above another aeroplane at an instance when their angles of elevation at some observation point are 60° and 45° respectively. How many metres higher is the one than the other? [4]

(b) Attempt this question on graph paper. [6]

The marks obtained by 200 students in an examination are given below:

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
No of Students	05	10	11	20	27	38	40	29	14	06

Draw an ogive for the given distribution on a graph sheet. Take the scale of 2 cm = 10 marks and 2 cm = 20 students for the appropriate axis.

Use your ogive to estimate the following:

(i) the median marks.

(ii) the lower quartile.

(iii) the number of students who obtained more than 80% marks in the examination.

(iv) the number of students who did not pass, if the pass percentage was 35.

Question 11

(a) If $\frac{(4x^2+3y^2)}{(4x^2-3y^2)}=\frac{11}{5}$, use properties of proportion to find: **(i)** $x^2 : y^2$ **(ii)** $\frac{x^2+y^2}{x^2-y^2}$ [3]

(b) For what value of p the points (11, 4), (1, –1) and (p, 1) are collinear? Hence, find the equation of the line. [3]

(c) Given $\begin{bmatrix} 4\sin 30° & \tan 45° \\ -3\cos 0° & 8\cos 60° \end{bmatrix} . X = \begin{bmatrix} 7 \\ 6 \end{bmatrix}$ [4]

(i) Write the order of the matrix X **(ii)** Find the matrix X