Class: X   **Subject: Mathematics**   **Max. Marks: 80**

Duration: 2 ½ hours   **Date : 13/01/2020**

Instructions

Answers of 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** questions 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 loss of marks.
The intended marks for questions or parts of questions are given in brackets [ ].
Mathematical tables are provided.


Section A [40 marks]

Question 1

(a) Using remainder and factor theorem, factorise the following polynomial: [3]
$x^3 - 19x + 30$

(b) A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been
spread evenly all around it in the shape of a circular ring of width 4 m to form
an embankment. Find the height of the embankment.   [3]

(c) In the adjoining figure, ABCD is a parallelogram. E is a point on AB. CE
intersects the diagonal BD at G and EF is parallel to BC. If $AE : EB = 1 : 2,$ find
(i) $EF : AD$
(ii) area of Δ BEF : area of Δ ABD
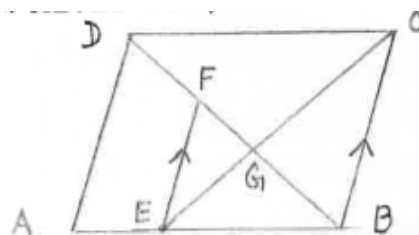
[4]

Question 2

(a) A manufacturer marks an article at ₹ 5000. He sells this article to a wholesaler at a discount of 25% on the marked price and the wholesaler sells it to a retailer at a discount of 15% on the marked price. If the retailer sells it to a consumer at the printed price and the sales are intra state, with the rate of GST as 18%, Calculate:

   (i)   The total amount (inclusive of tax) paid by the consumer for the article.
   (ii)   The amount of tax (under GST) paid by the wholesaler to the state government.
   (iii)   The amount of tax (under GST) received by the Central Government from the retailer.   [3]

(b) In the adjoining figure, O is the centre of the circle. $\angle DAE = 75°$. Find giving suitable reasons the measure of:
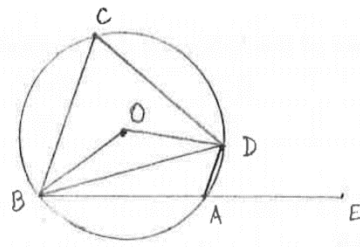
   (i) $\angle BCD$
   (ii) $\angle BOD$
   (iii) $\angle OBD$ [3]

(c) If the 3rd term and 9th term of an AP are 17 and 47 respectively, find:
   (i)   the common difference
   (ii)   the 20th term
   (iii) the sum of the first six terms   [4]

Question 3

(a) Solve the following inequation and graph the solution set on the number line: [3]
$$4x - 19 < \frac{3x}{5} - 2 \leq -\frac{2}{5} + x, x \in N$$

(b) Given $\begin{bmatrix} 4 & 6 \\ 0 & -4 \end{bmatrix} X = \begin{bmatrix} -8 \\ 8 \end{bmatrix}$

   Find: (i) the order of the matrix X
   (ii) the matrix X [3]

(c) Use a graph paper for this question:

   (i)   Plot the points A (1, 1), B (5, 1), C (4, 2) and D (2, 2)
   (ii)   Name the figure thus obtained and determine its area.
   (iii) Reflect the points A, B, C, and D on the line $y - 1 = 0$
   (iv)   Name two invariant points, from the figure, under reflection in the line mentioned in (iii)   [4]

Question 4

a) Prove that : $\sqrt{\dfrac{Sec\theta - 1}{Sec\theta + 1}} = Cosec\,\theta - \cot\theta$ [3]

b) Mia has a recurring deposit account in a bank for 2 years and deposits ₹ 800 per month. If she receives ₹ 20,400 at the time of maturity, find the rate of interest. [3]

c) The mean wage of the following data is 52. Find the missing frequency 'a'. [4]

Wages (in ₹)	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of workers	5	3	4	a	2	6	13

Section B [40 marks]
Answer any 4 questions

Question 5

a) Given, $A = \begin{bmatrix} 2 & 3 \\ -6 & 7 \end{bmatrix}$ $B = \begin{bmatrix} 5 & -2 \\ 7 & 8 \end{bmatrix}$ $C = \begin{bmatrix} 6 & 1 \\ 4 & 5 \end{bmatrix}$

Find $AB - 5C + 3I$, where I is a unit matrix of order 2. [3]

b) Anil possessed 500, ₹ 100 shares paying 15% dividend. He sold these shares at a discount of 20% and invested the proceeds in ₹ 100 shares paying 30% dividend at a premium of 25% . Find :

    i) selling price of the shares
    ii) the number of new shares bought with the proceeds
    iii) his change of income. [3]

c) Water flows at the rate of 10 m / minute through a cylindrical pipe 5 mm in diameter. How long will it take to fill a conical vessel whose diameter at the base is 40 cm and depth 24 $cm?$ [4]

Question 6

a) Solve the following quadratic equation and give your answer correct to three significant figures: $5x^2 + 19x - 7$ [3]

b) Using properties of proportion solve for x, given: $\dfrac{\sqrt{5x} + \sqrt{2x-6}}{\sqrt{5x} - \sqrt{2x-6}} = 4$ [4]

c) A bag contains identical cards marked 1 to 20. One card is selected at random, find the probability that: [3]

    i) it is a multiple of both 2 and 3
    ii) it is a prime number
    iii) it is neither divisible by 4 nor 6

Question 7

a) The terms of a G. P. are $-3,\ 9, -27\ \ldots$. Find the sum of the first six terms of the G. P. [3]

b) Use ruler and compasses only for this question:

    i)   Construct Δ ABC, where AB = 3.5cm, BC = 6 cm and $\angle$ ABC = 60°

    ii)   Construct the locus of the points inside the Δ which are equidistant from BA and BC and also from points B and C.

    iii)   Mark the point P which satisfies (ii) and then measure and record the length of PB [3]

c) A model of a ship is made to a scale of $1:300$. Calculate:

    i)   The length of the ship, if the length of the model is 2 m.

    ii)   The area of the deck of the model in m^2, if the area of the deck of the ship is $0.18\ km^2$

    iii)   The volume of the ship in km^3, if the volume of the model is $6.5\ m^3$ [4]

Question 8

a) Prove that: $\dfrac{Sec\theta + 1 + \tan\theta}{Sec\theta + 1 - \tan\theta} = Sec\ \theta + \tan\theta$ [3]

b) Find the equation of the perpendicular from the point P $(-1,\ -2)$ on the line $3x + 4y - 12 = 0$. Also find the co-ordinates of the foot of the perpendicular. [3]

c) Sonal can row a boat at a speed of 5 km / hour. If it takes her 1 hour more to row the boat 5.25 km upstream than to return downstream, find the speed of the stream. [4]
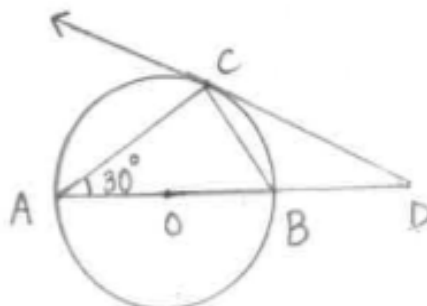
Question 9

a) A bag contains 8 green balls and some red balls. If the probability of drawing a red ball is half that of a green ball, then find the number of red balls in the bag. [3]

b) Write down the equation of the line whose slope is (-1) and which passes through P, where P divides the line segment joining A (-1, 2) and B (3, 6) in the ratio 1:3 [3]

c) The horizontal distance between two towers is 120m. The angle of elevation of the top and angle of depression of the bottom of the first tower as observed from the second tower are 30° and 24° respectively. Find the height of the two towers. Give your answer correct to 2 decimal places. [4]

Question 10

a) If (-4) is a root of the quadratic equation $x^2 + px - 4 = 0$ and the quadratic
equation $x^2 + px + k = 0$ has equal roots, find the value of k. [3]

b) In the given figure, O is the centre of the circle and $\angle BAC = 30°$. Prove that
$BC = BD$. [4]

c) A metallic sphere of radius $10.5\ cm$ is melted and then recast into small
cones, each of radius $3.5\ cm$ and height $3\ cm$. Find the number of cones thus
obtained. [3]

Question 11

Use a graph paper for this question

a) The marks obtained by some students in a competitive exam is 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	5	9	16	22	26	18	11	6	4	3

Draw an Ogive for the given distribution. Use the graph to estimate the following:

i) the median mark
ii) the inter-quartile range
iii) the number of students who obtained more than 75% marks
iv) the number of students who did not pass the test if minimum marks
required to pass is 40 . [6]

b) The marked price of an article is ₹ 7500. A shopkeeper buys the article from a
wholesaler at some discount and sells it to a customer at the marked price. The
sales are intrastate and the rate of GST is 12%. If the shopkeeper pays ₹ 90 as
tax (under GST) to the State Government, find:

i) the amount of discount
ii) The price inclusive of tax (under GST) of the article which the shopkeeper paid
to the wholesaler. [4]