Total No. of Printed Pages—16

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# MATHEMATICS

**( CANDIDATES WITH PRACTICALS/INTERNAL ASSESSMENT )**

*Full Marks* : 80
*Pass Marks* : 24

**( CANDIDATES WITHOUT PRACTICALS/INTERNAL ASSESSMENT )**

*Full Marks* : 100
*Pass Marks* : 30

*Time* : 3 hours

( For Both Categories of Candidates )

*The figures in the margin indicate full marks for the questions*

GENERAL INSTRUCTIONS :

(i) The question paper consists of 32 questions divided into six Sections A, B, C, D, E and F.

(ii) Question Nos. **1** to **30** (Section—A to Section—E) are to be answered by all the Candidates.

(iii) Question Nos. **31** and **32** of Section—F are to be answered by Candidates without Practicals/Internal Assessment only.

(iv) In Question Nos. **1** to **8** of Section—A and Question No. **31** sub nos. *(a)* to *(d)*, there are four answers marked (A), (B), (C), (D). Only one of these answers is correct. The letter indicating the correct answer should be written in capital in the answer book.

(v) In question on construction, the drawing should be neat and exactly as per the given measurements.

(vi) Questions which are meant for Visually Handicapped (Blind) Students, should be answered by them only.

(vii) Use of Calculator/Mobile Phone is not permitted.

## SECTION—A

( *Marks* : 10 )

*( Question Nos.* ***1*** *to* ***10*** *carry 1 mark each )*

**1.** A composite number should have at least

(A) one factor

(B) two factors

(C) three factors

(D) four factors

**2.** The degree of the polynomial $\frac{2 \quad 7x^2}{8} \quad x^3$ is

(A) 1

(B) 2

(C) 3

(D) 4

**3.** The common difference of the AP $0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, \cdots$ is

(A) 0

(B) $\frac{1}{4}$

(C) $\frac{1}{2}$

(D) $\frac{3}{4}$

**4.** Which of the following is not a quadratic equation?

(A) $x \quad \frac{1}{x^2} \quad 3$

(B) $3x \quad \frac{1}{x} \quad 8 \quad 0$

(C) $x^2 \quad 25$

(D) $(x \quad 1)(x \quad 3) \quad 0$

**5.** If $\sqrt{3}$ tan 1, for 0 90 , then the value of is

(A) 90°

(B) 60°

(C) 45°

(D) 30°

**6.** The point ( 4, 3) lies in

(A) first quadrant

(B) second quadrant

(C) third quadrant

(D) fourth quadrant

**7.** The surface area of a sphere of radius $r$ units is

(A) $r^2$ square units

(B) $\frac{1}{2}$ $r^2$ square units

(C) 4 $r^2$ square units

(D) 3 $r^2$ square units

**8.** In $ABC$, if $XY \| BC$ and $AX$ 4 cm, $XB$ 6 cm, $AY$ 3 cm, then $YC$ is equal to

(A) 6 cm

(B) 4 5 cm

(C) 3 cm

(D) 1 5 cm

**9.** Fill in the blanks :

*(a)* The tangent at any point of a circle is —— to the radius through the point of contact.

*(b)* The line joining mid-points of two sides of a triangle is —— to the third side.

**10.** Define cumulative frequency curve.

## SECTION—B

( *Marks* : 12 )

*( Question Nos.* ***11*** *to* ***16*** *carry 2 marks each )*

**11.** Find the zeroes of the quadratic polynomial $x^2$ $9x$ 20.

**12.** Find the value of $P$ for which the quadratic equation $3x^2$ $10x$ $P$ 0 has real roots.

*Or*

Which term of the AP 4, 0, 4, $\cdots$ is 392 ?

**13.** Prove that

$$\frac{\cos(90 \quad) \sin(90 \quad)}{\tan(90 \quad)} \quad \sin^2$$

**14.** If $A \quad 60$ , $B \quad 30$ , prove that

$$\cos(A \quad B) \quad \cos A \cos B \quad \sin A \sin B$$

*Or*

Prove that

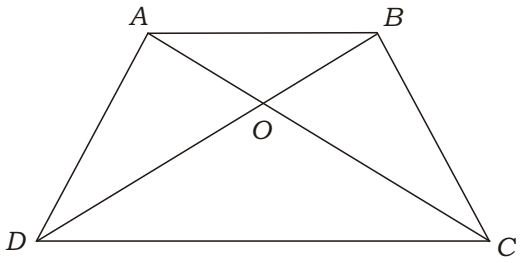
$$(1 \quad \tan^2 \ )(1 \quad \sin \ )(1 \quad \sin \ ) \quad 1$$

**15.** The lengths of the sides of a $ABC$ are $AB \quad 9$ cm, $BC \quad 40$ cm and $AC \quad 41$ cm. Show that the $ABC$ is a right-angled triangle.

*Or*

If $PT$ is a tangent to a circle with centre $O$ and $OP \quad 17$ cm, $OT \quad 8$ cm, find the length of the tangent $PT$.

**16.** In the adjoining figure, $AO : OC \quad BO : OD \quad 1 : 3$ and $AB \quad 6$ cm, find $CD$.



**[ For Visually Handicapped (Blind) Students only, in lieu of Question No. 16 above ]**

**16.** *(a)* Define a right-angled triangle. 1

*(b)* If the pairs of corresponding sides of two triangles are ——, the triangles are equiangular. (Fill in the blank) 1

## SECTION—C

( *Marks* : 18 )

*( Question Nos.* ***17*** *to* ***22*** *carry 3 marks each )*

**17.** Using Euclid's division algorithm, find the HCF of 4830 and 759.

**18.** The third term of an AP is 18 and the seventh term is 30. Find its 17th term.

*Or*

The age of father is equal to the square of the age of his son. The sum of the ages of the father and five times the age of the son is 66 years. Find their ages.

**19.** Find a point on the *y*-axis which is equidistant from the points (5, 4) and ( 2, 3).

**20.** If $x \quad a\cos^3 \quad$ and $y \quad b\sin^3 \quad$, then prove that

$$\left(\frac{x}{a}\right)^{2/3} \quad \left(\frac{y}{b}\right)^{2/3} \quad 1$$

*Or*

Prove that

$$\frac{\sin}{1 \quad \cos} \quad \frac{\sin}{1 \quad \cos} \quad 2\,\text{cosec}$$

**21.** A chord of a circle of radius 10 cm makes a right angle at the centre of the circle. Find the area of the minor segment so formed. (Use $\frac{22}{7}$)

*Or*

From an equilateral triangle of side 24 cm, a circle of radius 7 cm is cut off. Find the area of the remaining portion of the triangle. (Use $\sqrt{3} \quad 1\ 732$)

**22.** A bag contains 6 black, 7 red and 2 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is—

*(a)* red;

*(b)* black or white;

*(c)* not black.

## SECTION—D

( *Marks* : 16 )

*( Question Nos.* ***23*** *to* ***26*** *carry 4 marks each )*

**23.** The width of a rectangle is two-third of its length and the length exceeds the width by 7 cm. Find the perimeter of the rectangle.

**24.** Prove that, the points $A$ (3, 4), $B$ ( 4, 3), $C$ (5, 0) lie on the circle with centre $O$ (0, 0), the origin.

*Or*

Show that, the points $A$ (0, 3), $B$ ( 2, 6), $C$ (4, 3) are collinear.

**25.** From the top of a vertical tower 96 m high, the angles of depression of two cars on a road at the same level as the base of the tower and on the same side of it are and , where tan $\frac{3}{4}$ and tan $\frac{1}{3}$. Find the distance between the two cars.

*Or*

The height of a tower is half the height of the flagstaff at its top. The angle of elevation of the top of the tower as seen from a distance of 10 m from its foot is 30°. Find the angle of elevation of the top of the flagstaff from the same point.

**[ For Visually Handicapped (Blind) Students only, in lieu of Question No. 25 above ]**

**25.** *(a)* Prove that

$$\frac{1 \quad \tan^2}{\text{cosec}^2} \quad \tan^2 \qquad 2$$

*(b)* $\text{cosec}^2$ $\cot^2$ ——. (Fill in the blank) 1

*(c)* If sin cos , then 45 (State whether True or False) 1

**26.** Using ruler and compass only, construct a circle of radius 4 cm and also construct two tangents from a point *A* at a distance 6 cm away from the centre of the circle. (Only traces of construction are required.)

**[ For Visually Handicapped (Blind) Students only, in lieu of Question No. 26 above ]**

**26.** *(a)* Define a semicircle. 1

*(b)* The perimeter of a circle is referred to as the (circumference/area) of a circle. (Choose the correct answer) 1

*(c)* A diameter of a circle is a chord which passes through the centre of the circle. (State whether True or False) 1

*(d)* The lengths of the two tangents drawn from an external point to a circle are ——. (Fill in the blank) 1

SECTION—E

( *Marks* : 24 )

*( Question Nos.* ***27*** *to* ***30*** *carry 6 marks each )*

**27.** Solve the following system of linear equations graphically :

$2x \quad y \quad 7$

$2y \quad x \quad 4$

Shade the region bounded by these two lines and *X*-axis. (Plot at least three points for each graph).

**[ For Visually Handicapped (Blind) Students only, in lieu of Question No. 27 above ]**

**27.** Solve the following system of linear equations :

$2x \quad 3y \quad 12$

$x \quad y \quad 1$

**28.** Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides. 4

Using the above result, do the following :

The areas of two similar triangles *ABC* and *PQR* are 25 $cm^2$ and 49 $cm^2$ respectively. If *QR* 9 8 cm, find *BC*. 2

**[ For Visually Handicapped (Blind) Students only, in lieu of Question No. 28 above ]**

**28.** *(a)* Define similar triangles. 2

*(b)* If the base and altitude of a triangle are 12 cm and 7 cm respectively, find its area. 2

*(c)* In a right-angled triangle, the square of the —— is equal to the sum of the squares of the other two sides.
(Fill in the blank) 1

*(d)* The sum of all the angles of a triangle is two right angles.
(State whether True or False) 1

**29.** A box with lid is made of 2 cm thick wood. The external dimensions of the box are 25 cm 18 cm 15 cm respectively. Find the inner volume of the box and the volume of wood used in it. 6

*Or*

A vessel in the form of a hemispherical bowl is full of water. The contents are emptied into a cylinder. The internal radii of the bowl and cylinder are 6 cm and 4 cm respectively. Find the height of water level in the cylinder.

**30.** Find the mean weight of the following data : 6

| *Weight* (in kg) | 25–31 | 31–37 | 37–43 | 43–49 | 49–55 | 55–61 |
|---|---|---|---|---|---|---|
| *No. of students* | 10 | 6 | 8 | 12 | 5 | 9 |

*Or*

The daily wages of 160 workers in a building project are given below :

| *Wages* (in ₹) | 0–10 | 10–20 | 20–30 | 30–40 | 40–50 | 50–60 | 60–70 | 70–80 |
|---|---|---|---|---|---|---|---|---|
| *No. of workers* | 12 | 20 | 30 | 38 | 24 | 16 | 12 | 8 |

Find the median wage of the workers.

SECTION—F

( *Marks* : 20 )

**[ For Candidates without Practicals/Internal Assessment only ]**

**31.** Answer the following (any *eight*) : 1×8=8

*(a)* Which of the following are twin primes?

(A) 9, 11

(B) 11, 13

(C) 13, 15

(D) 15, 17

*(b)* Which of the following is a binomial?

(A) $2x$

(B) $3x \quad 2x$

(C) $3x \quad 2$

(D) $3x^2 \quad 2x \quad 1$

*(c)* In a pair of linear equations $a_1x \quad b_1y \quad c_1 \quad 0$ and $a_2x \quad b_2y \quad c_2 \quad 0$, if $\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$, then the equations will represent

(A) intersecting lines

(B) parallel lines

(C) coincident lines

(D) None of the above

*(d)* The solutions of the quadratic equation $2x^2 \quad 9x \quad 0$ are

(A) $0, \quad \frac{9}{2}$

(B) $0, \frac{9}{2}$

(C) $0, \quad \frac{2}{9}$

(D) $0, \frac{2}{9}$

*(e)* Those sequences whose general term can be expressed as a formula, are called ——. (Fill in the blank)

*(f)* Find the perimeter of an equilateral triangle whose side is 10 cm.

*(g)* The point of intersection of the axes has coordinates (0, 0) and is known as the ——. (Fill in the blank)

*(h)* Prove that cos cos (90 ) sin (90 ) sin 0

*(i)* If you look downwards at an object, the angle formed between the horizontal and your line of sight is called the angle of elevation. (State whether True or False)

*(j)* A —— may be regarded as a collection of points in a plane at a fixed distance from a fixed point. (Fill in the blank)

*(k)* Find the area of a square whose side is 5 m.

*(l)* Find the volume of a cube whose edge is 4 m.

*(m)* Define mode.

*(n)* A coin is tossed twice. List all the possible outcomes using H for head and T for tail.

**32.** Answer any *six* from the following : 2×6=12

*(a)* Find the HCF of 196 and 364 by prime factorization method.

*(b)* Find a quadratic polynomial whose sum and product of the zeroes respectively are $\frac{11}{6}$ and $\frac{1}{2}$.

*(c)* Solve $x^2 \quad 5x \quad 6 \quad 0$ by factorization method.

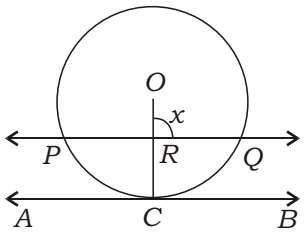
*(d)* Write the first two terms of the sequence whose *n*th term ($t_n$) is given by $t_n \quad \frac{2n \quad 3}{6}$.

*(e)* The perimeters of two similar triangles are 24 cm and 18 cm. If one side of the first triangle is 8 cm, what is the corresponding side of the other?

*(f)* Find the distance between the points (4, 7) and ( 4, 7).

*(g)* If 30 , prove that sin 2 2 sin cos .

*(h)* In the adjoining figure, *O* is the centre of the circle and *AB* is a tangent to the circle at *C*. If *PQ* || *AB*, find the value of *x*.




*(i)* Find the volume of a hemisphere of radius 21 cm. (Use $\frac{22}{7}$)

*(j)* A library has 3000 books of fiction and 4000 books of non-fiction. What is the probability that a book selected at random is *(i)* a fiction and *(ii)* a non-fiction?

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