120184

ELEMENTARY MATHEMATICS

Time: 3 Hours | Full Marks: 100

Instructions : *(1) Answer **all** questions.*

(2) The figures in the right-hand margin indicate full marks for the questions.

1. *(a)* Simplify :

$$\sqrt[4]{\left(\frac{132}{143}\right)^{-2}}$$

(b) Factorise :

$$y^2 - 8y + 16$$

(c) If $(a, b) = (0, -2)$, find the value of a and b.

(d) Find the curved surface area of a right circular cone whose slant height is 10 cm and base radius is 7 cm.

(e) Write the formula for finding the area of a triangle when sides are given.

(f) Mean of 15 observations is 23, If each observation is multiplied by 2, find the new mean.

(g) Simplify :

$$\sqrt{72} + \sqrt{800} - \sqrt{18}$$

(h) Find the value of m, if $x + 4$ is a factor of the polynomial $x^2 + 3x + m$.

(i) Factorise :

$$20x^2 - 9x + 1$$

(j) Calculate the edge of the cube, if its volume is 1331 cm^3. 1×10=10

2. *(a)* If $p + q = 12$ and $pq = 27$, find the value of $p^3 + q^3$.

(b) What are the radius and curved surface area of a cone made from a quadrant of a circle of radius 28 cm?

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(c) The volume of a cylindrical pipe is 748 cm^3. Its length is 0.14 m and its internal radius is 0.09 m. Find the thickness of the pipe.

(d) Find the area of a triangular region, two sides of which are 18 m and 10 m and the perimeter is 42 m.

(e) If $x^2 + \frac{1}{x^2} = 7$, find the value of $x^3 + \frac{1}{x^3}$, taking only the positive value of $x + \frac{1}{x}$. 3×5=15

3. Answer any *five* of the following : 7×5=35

(a) Cost of 1 pen is x and that of 1 pencil is y. Cost of 2 pens and 3 pencils together is 18. Write the linear equation which satisfies the data.

(b) Find the value of a and b if

$$\frac{2\sqrt{5}+\sqrt{3}}{2\sqrt{5}-\sqrt{3}} + \frac{2\sqrt{5}-\sqrt{3}}{2\sqrt{5}+\sqrt{3}} = a + \sqrt{15}b$$

(c) Without actually calculating the cubes, evaluate $14^3 + 13^3 - 27^3$.

(d) Show that $\frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2} = 5$

(e) In a mathematics test taken to 15 students, the following marks (out of 90) are recorded :

41, 39, 48, 52, 46, 62, 54, 40, 88, 52, 86, 40, 42, 52, 60

Find the mean of the above data.

(f) Factorise :

$a^9 + b^9 + 3a^6b^3 + 3a^3b^6$

(g) If a wooden box of dimensions 8 m×7 m×6 m is to carry boxes of dimensions 8 cm×7 cm×6 cm, then find the maximum number of boxes that can be carried in the wooden box.

4. Answer any *four* of the following : 10×4=40

(a) A solid cylinder has total surface area 462 cm^2. Its covered surface area is one-third of its total surface area. Find the following :

(i) Its radius

(ii) Its height

(iii) Its volume

(b) Factorise :

$6x^3 - 5x^2 - 13x + 12$

(c) The electricity bills (in Rs.) of 20 households in a locality are as follows :

375, 415, 525, 275, 815, 720, 1085, 717, 807, 780,

315, 380, 417, 425, 375, 223, 245, 255, 615, 575

Construct a frequency distribution table with class size 100.

(d) The sides of a triangular field are 51 m, 37 m and 20 m. Find the number of rose beds that can be prepared in the field if each rose bed occupies a space of 6 sq. m.

(e) The frame of a lamp shade is cylindrical in shape. It has base diameter 28 cm and height 17 cm. It is to be covered with a decorative cloth. A margin of 2 cm is to be given for folding it over top and bottom of the frame. If $\frac{1}{12}$ of the cloth is wasted in cutting and pasting, then find how much cloth is required to be purchased for covering the frame.

(f) Find the volume of a sphere whose surface area is 154 cm^2.

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