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B.Sc. (Food Tech.)/B.F.S.T (Hons.) (Semester – 1st)
MATHEMATICS
Subject Code: BFOTS1103
Paper ID: [211317033]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1 Attempt the following:

(a) The area of rhombus is 240 cm^2 and one of the diagonals is 16 cm. Find the other diagonal.

(b) If A = [2 1 4 3], find the inverse of A if it exists.

(c) Find the 15th term in the geometric progression with the term $a = 2$ and common ratio $r = 3$.

(d) A circular path is 3m wide and surrounds a circular garden with a radius of 10m. Find the area of the path.

(e) A rectangular paper of width 14cm is rolled along its width and a cylinder of width 20cm is formed. Find the volume of the cylinder. (Take $\frac{22}{7}$ for π)

(f) A milk tank is in the form of cylinder whose radius is 1.5m and length is 7m. Find the quantity of milk in litres that can be stored in the tank?

(g) Without expanding, prove that

$$\Delta = |x + y\ y + z\ z + x\ z\ x\ y\ 1\ 1\ 1\ | = 0$$

(h) Find the zeroes of the quadratic polynomial $x^2 + 7x + 10$, and verify the relationship between the zeroes and the coefficients.

(i) Find the 10th and n^{th} terms of the G.P. 5, 25, 125, … .

(j) Find the quadratic polynomial whose sum and product of roots are $\sqrt{2}$ and $\frac{1}{3}$ respectively.

Section – B **(5 marks each)**

Q2 The internal measures of a cuboidal room are $12m \times 8m \times 4m$. Find the total cost of whitewashing all four walls of the room, if the cost of whitewashing is ₹5 per m^2. What will be the cost of whitewashing if the ceiling of the room is also whitewashed?

Q3 Simplify $cos\theta[cos\theta\ sin\theta\ -\ sin\theta\ cos\theta\ ] + sin\theta[sin\theta\ -\ cos\theta\ cos\theta\ sin\theta\ ]$.

Q4 The ratio of the sums of m and n terms of an A.P. is $m^2 : n^2$. Show that the ratio of mth and n^{th} term is $(2m - 1) : (2n - 1)$.

Q5 Find $A^2 - 5A + 6I$, if A= [2 0 1 2 1 3 1 − 1 0].

Q6 A cuboid is of dimensions $60cm \times 54cm \times 30cm$. How many small cubes with side $6cm$ can be placed in the given cuboid.

Section – C **(10 marks each)**

Q7 (i) Verify that the numbers given alongside of the cubic polynomials below are their zeroes. Also verify the relationship between the zeroes and the coefficients:

$2x^3 + x^2 - 5x + 2;\ \ \frac{1}{2},\ 1,\ -2$

(ii) Shanti Sweets Stall was placing an order for making cardboard boxes for packing their sweets. Two sizes of boxes were required. The bigger of dimensions 25 cm × 20 cm × 5 cm and the smaller of dimensions 15 cm × 12 cm × 5 cm. For all the overlaps, 5% of the total surface area is required extra. If the cost of the cardboard is ₹4 for $1000cm^2$, find the cost of cardboard required for supplying 250 boxes of each kind.

Q8 (i) If each edge of a cube is doubled,

(a) How many times will its surface area increase?

(b) How many times will its volume increase?

(ii) If $[cos\theta\ sin\theta\ -\ sin\theta\ cos\theta\ ]$, then prove that $A^n = [cosn\theta\ sinn\theta\ -\ sin\theta\ cos\theta\ ]$, n $\in N$. (4 marks)

(iii) How many numbers are there between 99 and 1000, having at least one of their digits 7.

Q9 (a) The floor of a building consists of 3000 tiles which are rhombus shaped and each of its diagonals are 45 cm and 30 cm in length. Find the total cost of polishing the floor, if the cost per m^2 is ₹ 4.

(b) Find the inverse of the following matrix using elementary operations

[0 1 2 1 2 3 3 1 1]