

PART – B(5×16=80 Marks)

11. a) i) 1) Find the curved surface area and total surface area of a hollow hemisphere whose outer and inner radii are 4.2 cm and 2.1 cm respectively. (4)
- 2) A solid is in the shape of a cylinder surmounted on a hemisphere. If the diameter and the total height of the solid are 21 cm, 25.5 cm respectively. Then find its volume. (4)
- ii) Prove that, when n is an integer,
 $(1 + \cos \theta + i \sin \theta)^n + (1 + \cos \theta - i \sin \theta)^n = 2^{n+1} \cos^n(\theta/2) \cos(n\theta/2)$. (8)
- (OR)
- b) i) Prove that $\sin 7\theta = 7 \sin \theta - 56 \sin^3 \theta + 112 \sin^5 \theta - 64 \sin^7 \theta$. (8)
- ii) 1) The curved surface area of a hollow cylinder is 540π sq. cm. Its internal diameter is 16 cm and height is 15 cm. Find the total surface area. (4)
- 2) A tent is in the shape of a right circular cylinder surmounted by a cone. The total height and the diameter of the base are 13.5 m and 28 m. If the height of the cylindrical portion is 3 m, find the total surface area of the tent. (4)
12. a) i) Find the equation of the plane passing through the points (1, -2, 2) and (-3, 1, -2) and perpendicular to the plane $2x + y - z = -6$. (8)
- ii) Find the equation of the plane that contains the parallel lines
 $\frac{x-3}{1} = \frac{y-2}{-4} = \frac{z-1}{5}$ and $\frac{x-2}{1} = \frac{y+3}{-4} = \frac{z+1}{5}$. (8)
- (OR)
- b) i) Prove that the lines $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ and $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ are coplanar. Find the co-ordinates of their point of intersection. (8)
- ii) Find the equations of the tangent planes to the sphere $x^2 + y^2 + z^2 - 4x - 2y - 6z + 5 = 0$ which are parallel to the plane $x + 4y + 8z = 0$. (8)

13. a) i) If z is a function of x and y , where $x = e^u + e^{-v}$ and $y = e^{-u} - e^v$, then show that $\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y}$. (6)

ii) Examine the function $f(x, y) = x^3y^2(1 - x - y)$ for extreme values. (10)

(OR)

b) i) Find the Taylor's series expansion of $f(x, y) = e^x \cos y$ in powers of x and y up to the second degree terms. (8)

ii) Evaluate the integral $\int_0^1 \frac{\ln(1+x)}{1+x^2} dx$. (8)

14. a) Solve the following equations.

i) $(D^2 + 6D + 9)y = e^{-2x}x^3$. (8)

ii) $((2x + 3)^2D^2 - 2(2x + 3)D - 12)y = 6x$. (8)

(OR)

b) Solve the following equations.

i) $\frac{dx}{dt} - y = t, \frac{dy}{dt} + x = t^2$. (8)

ii) $(x^2D^2 + 4xD + 2)y = \sin x$. (8)

15. a) Find the mean, standard deviation, median and mode for the following data : (16)

Class : 1 - 10 11 - 20 21 - 30 31 - 40 41 - 50 51 - 60

Frequency : 3 16 26 31 16 8

(OR)

b) i) Find the correlation coefficient between x and y , when the lines of regression are $2x - 9y + 6 = 0$ and $x - 2y + 1 = 0$. (8)

ii) Three groups of children contain respectively 3 girls and 1 boy; 2 girls and 2 boys; 1 girl and 3 boys. One child is selected at random from each group. Find the chance of selecting 1 girl and 2 boys. (8)
