7. (a) Expand $\sin^3\theta$, $\cos^4\theta$ in terms of sines of multiples of θ.

   (b) Express $\sin^3\theta$ in terms of sines of multiples of x.

8. Find the equation of the sphere through the circle

$$x^2 + y^2 + z^2 + 2x + 3y + 5z = 0;$$

$$2x + 6y + 5z - 6 = 0$$

and passing through the center of the sphere

$$x^2 + y^2 + z^2 - 2x - 4y + 6z + 1 = 0$$

9. Find the shortest distance between the lines

$$2x - 2y + 3z - 12 = 0 = 2x + 2y + z$$

and $2x - z = 0 = 5x - 2y + 9$.

10. Verify the lines

$$\frac{x-2}{7} = \frac{y-4}{2} = \frac{z-5}{2}$$

and $$\frac{x-5}{2} = \frac{y-8}{3} = \frac{z-7}{2}$$

are coplanar. Find the equation of the plane containing them.

Register Number :

Name of the Candidate :

5 2 4 3

B.Sc. DEGREE EXAMINATION, 2008

(APPLIED CHEMISTRY / ELECTRONIC SCIENCE / PHYSICS)

(FIRST YEAR)

(PART - III - B - ANCILLARY)

550. MATHEMATICS - I

December] [Time : 3 Hours

Maximum : 75 Marks

Answer any FIVE questions.
All questions carry equal marks.
(5 × 15 = 75)

1. (a) Find the sum to infinity of the series

$$\frac{7}{72} + \frac{7\cdot28}{72\cdot96} + \frac{7\cdot28\cdot49}{72\cdot96\cdot120} + \ldots\ldots\infty$$

Turn over

Prove that

$$1 + \left(\frac{1}{2} + \frac{1}{3}\right) \cdot \frac{1}{4} + \left(\frac{1}{4} + \frac{1}{5}\right) \cdot \frac{1}{4^2} + \left(\frac{1}{6} + \frac{1}{7}\right) \cdot \frac{1}{4^3} + \ldots\ldots = z \log \sqrt{12}.$$

2. (a) State and prove Lagrange's theorem on finite groups.

   (b) If f is a homomorphism of a group G into a group G′ with Kernal K, prove that

$$\frac{G}{K} \cong G'.$$

3. (a) If

$$y = \sinh^{-1} x$$

prove that

$$(1 + x^2)\, y_{n+2} + (2n + 3)x\, y_{n+1} + (n + 1)^2\, y_n = 0.$$

   (b) Find the maxima and minima of the function $x^3 y^2 (6 - x - y)$.

4. Show that the systems of equations

$$x + y + z = 6$$

$$x + 2y + 3z = 14$$

$$x + 4y + 7z = 30$$

is consist and hence, solve it.

5. Find the eigen value and eigen vectors of the matrix

$$A = \begin{pmatrix} 0 & 1 & 1 \\ -4 & 4 & 2 \\ 4 & -3 & -1 \end{pmatrix}.$$

6. (a) Separate into real and imaginary part of $\sin(x - iy)$.

   (b) If

$$\tan\left(\frac{x}{2}\right) = \tanh\left(\frac{y}{2}\right),$$

prove that

$$\sinh y = \tan x$$