8. (a) Obtain a cosine series for e^{-ax} where $0 \leq x < \infty$.

   (b) Obtain a sine series for unity in $0 < x < \pi$.

9. Find :

$$L\,(t^3 + 3t^2 - 6t + 8).$$

   Find :

$$L^{-1}\left(\frac{1}{s(s^2 + a^2)}\right)$$

10. Using Laplace transform solve the differential equation

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t$$

$y(0) = 0$ and $y'(0) = 0$.

Register Number :

Name of the Candidate :

5 2 4 6

B.Sc. DEGREE EXAMINATION, 2008

(APPLIED CHEMISTRY / ELECTRONIC SCIENCE)

(SECOND YEAR)

(PART - III - B - ANCILLARY)

660 / 650. MATHEMATICS - II

(Including Lateral Entry)

December] [Time : 3 Hours

Maximum : 75 Marks

Answer any FIVE questions.
All questions carry equal marks.

(5 × 15 = 75)

1. (a) Establish a reduction formula for

$$I_n = \int \sin^n x \, dx$$

   where $n \in N$.

   (b) Evaluate

$$I = \int_0^1 \int_0^2 xy^2 \, dy \, dx.$$

Turn over

2. (a) Show that

$$\nabla \cdot r^n \vec{r} = (n + 3)\, r^n$$

where $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$

and $|\vec{r}| = r$.

(b) Evaluate

$$\iint_S \vec{F} \cdot \vec{n}\, ds$$

using Gauss divergence theorem for the function

$$\vec{F} = 2xz\,\vec{i} + yz\,\vec{j} + z^2\vec{k}$$

over the upper half of the sphere

$$x^2 + y^2 + z^2 = a^2.$$

3. (a) Solve :

$$P^2 + 2Py \cot x = y^2.$$

(b) Solve :

$$(D^2 + 4D + 5)y = e^x + x^2 + \cos 2x.$$

4. (a) Solve :

$$y = (x - a)P = P^2.$$

(b) Solve :

$$(D^2 - 4D + 13)y = e^{2x} \cos 3x.$$

5. (a) Solve :

$$pq + p + q = 0.$$

(b) Solve :

$$x = p + yzq = xy.$$

6. (a) Solve :

$$\frac{y - z}{yz}\, p + \frac{z - x}{zx}\, q = \frac{x - y}{xy}.$$

(b) Solve :

$$p^2 - q^2 = 4.$$

7. Express

$$f(x) = \frac{1}{2}(\pi - x)$$

as Fourier series with period 2π to be valid in the interval 0 to 2π.

Deduce that

$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots\ldots = \frac{\pi}{4}.$$