

Visvesvaraya National Institute of Technology
Department of Mathematics
I sessional Examination(2014)-MAL-201
Integral Transforms and Partial Differential Equations

Time: 1 hour

Marks: 15

i) Answer any five questions. ii) All questions carry equal marks.

Q.1 Let $f(x) = \begin{cases} x, & -\frac{\pi}{2} < x \leq \frac{\pi}{2} \\ 0, & \frac{\pi}{2} < x < \frac{3\pi}{2}, \end{cases}$ $f(x+2\pi) = f(x)$. Find Fourier series of the function $f(x)$.
Hence, show that $\frac{\pi^2}{8} = \sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}$. [2+1]

Q.2 Find the Fourier cosine series for the function: $f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} \leq x < \pi. \end{cases}$

Q.3 Find the frequency spectrum of the function $f(x) = \begin{cases} -2 \cos x, & -\frac{\pi}{2} < x < 0 \\ 2 \cos x, & 0 \leq x < \frac{\pi}{2}. \end{cases}$

Q.4 Eliminate the arbitrary constants/functions from the following to form a p.d.e.:

(i) $2z = (ax + y)^2 + b$ (ii) $f(x^3 - y^3, x^2 - z^2) = 0$ [1+2]

Q.5 Find the solution of the p.d.e $(x - y)y^2p + (y - x)x^2q = (x^2 + y^2)z$ passing through the curve $xz = a^3, y = 0$.

Q.6 Find the general solution of the p.d.e $(D^2 + 3DD' + 2D'^2)z = (x^2 - 1)e^y$.