



(IX)  $L [ t \sin t ] =$

a)  $\frac{1}{s^2+1}$

b)  $\frac{2s}{(s^2+1)^2}$

c)  $\frac{s}{s^2+1}$

d)  $\frac{2}{(s^2+1)^2}$

(X) In a Fourier series expansion of an even function in the interval  $(-\pi, \pi)$  which of the following becomes zero ?

a)  $a_0$

b)  $a_n$

c)  $b_n$

d) Given  $f(x)$

**PART- B , Q.No. 2;** Short answer type questions

Answer the following questions ( $2 \times 5 = 10$  marks)

i) Find  $a_0$  in the Fourier series expansion of

$$f(x) = \sqrt{1 - \cos x} ; 0 < x < 2\pi$$

ii) Solve  $(y \cos x + 1) dx + \sin x dy = 0$

iii) Find Particular Integral of  $(D^2 + 4)y = \cos 2x$

iv) A problem in mathematics is given to three students A, B, C whose chances of solving it are  $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$  respectively. Find the probability that the problem will be solved.

v) Find the Laplace transform of  $\sin 2t \cdot \cos 3t$

**PART - C**

(Answer ANY 5 of the following 7 questions)

Each question is for 10 marks.

**Q.3** a) Express  $f(x) = |x|, -\pi < x < \pi$ , as Fourier series 5+5 marks

b) Expand  $\pi x - x^2$  in a half-range sine series in the interval  $(0, \pi)$  upto first three terms

**Q.4** a) Find the inverse Laplace transform of  $\frac{5s+3}{(s-1)(s^2+2s+5)}$  5+5 marks

b) Evaluate:  $\int_0^\infty \frac{e^{-t} \sin^2 t}{t} dt$

**Q.5** a) Solve:  $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - 3y = x^2 \log x$  5+5 marks

b) Solve:  $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$

**Q.6** a) Find the Laplace transform of  $\frac{1-\cos 2t}{t}$  5+5 marks

b) Solve  $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 5x = e^{-t}\sin t, x(0) = 0, x'(0) = 1$

**Q 7**

a) If  $w = \log z$ , where  $z$  is a complex variable, find  $\frac{dw}{dz}$  and determine where 'w' is non analytic. 5 Marks

b) Evaluate  $\oint_C \frac{\sin^2 z}{(z-\frac{\pi}{6})^3} dz$ , where  $C$  is the circle  $|z| = 1$ , by Cauchy's Integration. 5 Marks

**Q8.** a) Evaluate  $\oint_C \frac{z-3}{z^2+2z+5} dz$ , where  $C$  is a circle  $|z+1-i| = 2$ , Use Residue theorem. 5 Marks

b) Expand  $f(z) = \frac{1}{(z-1)(z-2)}$  in the region  $|z| < 1$  as a Taylor series. 5 Marks

**Q.9** a) Apply convolution theorem to evaluate  $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$  10 marks