PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

Fourier Series - CSIR NET Physics PYQs

Mathematical Physics . All PYQs (2015-2025) with answer key

3 questions . Answer key included

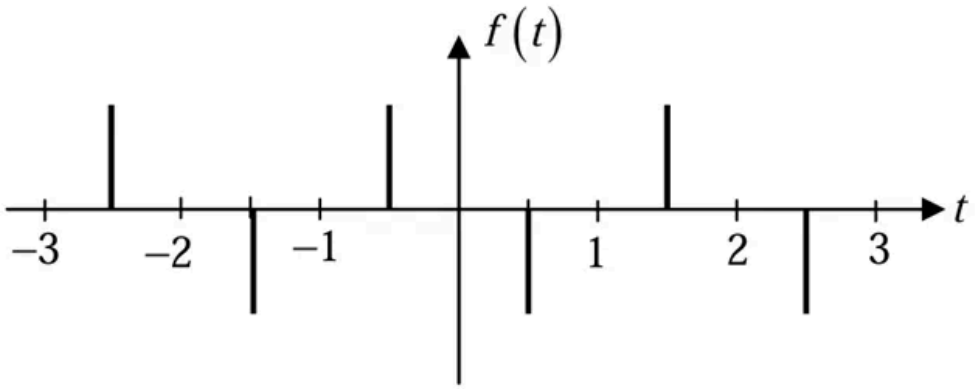
www.physicsbyaaryan.com . www.csirnetphysics.com
Contact: 9501976811

Q1. [June 2015] . 3.5 marks

Mathematical Physics > Fourier Series

CSIR NET	2015 June	3.5 M

Consider the periodic function f(t) with time period T as shown in the figure below



The spikes, located at $t = \frac{1}{2}(2n-1)$, where $n = 0, \pm1, \pm2, \cdots$, are Dirac-delta functions of strength ±1. The amplitudes a_n in the Fourier expansion

$$f(t) = \sum_{n=-\infty}^{\infty} a_n e^{2\pi i n t/T}$$

are given by

1. $(-1)^n$
2. $\frac{1}{n\pi} \sin \frac{n\pi}{2}$
3. $i \sin \frac{n\pi}{2}$
4. $n\pi$

Q2. [June 2016] . 3.5 marks

Mathematical Physics > Fourier Series

CSIR NET	2016 June	3.5M

The Gauss hypergeometric function $F(a,b,c;z)$, defined by the Taylor series expansion around $z=0$ as $F(a,b,c;z) =$

$$\sum_{n=0}^{\infty} \frac{a(a+1)\cdots(a+n-1)b(b+1)\cdots(b+n-1)}{c(c+1)\cdots(c+n-1)n!} z^n,$$

satisfies the recursion relation

1. $\frac{d}{dz}F(a,b,c;z) = \frac{c}{ab}F(a-1,b-1,c-1;z)$
2. $\frac{d}{dz}F(a,b,c;z) = \frac{c}{ab}F(a+1,b+1,c+1;z)$
3. $\frac{d}{dz}F(a,b,c;z) = \frac{ab}{c}F(a-1,b-1,c-1;z)$
4. $\frac{d}{dz}F(a,b,c;z) = \frac{ab}{c}F(a+1,b+1,c+1;z)$

Q3. [Dec 2019] . 5.0 marks

Mathematical Physics > Fourier Series

CSIR NET	2019 Dec	5M

The function $f(t)$ is a periodic function of period 2π. In the range $(-\pi, \pi)$, it equals e^{-t}. If $f(t) = \sum_{-\infty}^{\infty} c_n e^{\text{int}}$ denotes its Fourier series expansion, the sum $\sum_{-\infty}^{\infty} |c_n|^2$ is

1. 1
2. $\frac{1}{2\pi}$
3. $\frac{1}{2\pi}\cosh(2\pi)$
4. $\frac{1}{2\pi}\sinh(2\pi)$

Answer Key

3 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Mathematical Physics	Fourier Series	**3**
Q2	Mathematical Physics	Fourier Series	**4**
Q3	Mathematical Physics	Fourier Series	**4**

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Contact
9501976811