



DG-3160
Third Year B. Sc. (Sem. V) Examination
March/April - 2016
Fourier Series - I
(Generic Elective - 5004) (1)

Time : Hours]

[Total Marks : 50

Instructions :

(1)

<p>नीचे दशांशके निशानीवाणी विगतो उत्तरवही पर अवश्य लपवी. Fillup strictly the details of signs on your answer book.</p> <p>Name of the Examination : B. Sc. (Sem. 5)</p> <p>Name of the Subject : FOURIER SERIES - 1 (GENERIC ELECTIVE - 5004) (1)</p> <p>Subject Code No. : 3 1 6 0 Section No. (1, 2,.....): Nil</p>	<p>Seat No. : [][][][][][][]</p> <p style="text-align: center;">Student's Signature</p>
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- (2) All questions are compulsory.
(3) Figures to the right indicate marks of the corresponding question.

- Q:1** Answer the following:(Any Five) **05**
- 1 Discuss about half wave rectifier.
 - 2 Define Periodic Function.
 - 3 Define odd and even function. Hence state its properties.
 - 4 Discuss about triangular wave form.
 - 5 Define Half Range sine series.
 - 6 Write the Complex form of Fourier series.
 - 7 Evaluate $\int_{\alpha}^{\alpha+2\pi} \cos^2 n x dx$
- Q:2.a** Discuss regarding the functions having points of discontinuity. **07**
- OR
- Q:2.a** Find a Fourier series to represent $x - x^2$ between $-\pi$ to π . **07**

Q:2.b Attempt any one. 08

1 Expand $f(x) = x \sin x$; $0 < x < 2\pi$. In F.S.

2 Show that $x^2 = \frac{\pi^2}{3} + 4 \sum_1^{\infty} (-1)^n \frac{\cos nx}{n^2}$; $-\pi < x < \pi$, then show that

$$(i) \sum \frac{1}{n^2} = \frac{\pi^2}{6} \quad (ii) \sum \frac{(-1)^{n-1}}{n^2} = \frac{\pi^2}{12}$$

Q:3.a Discuss about the change of an interval in Fourier Series. 07

OR

Q:3.a Derive the formula for fourier expansion of odd or even function. 07

Q:3.b Attempt any one. 08

1 Find the Fourier series to represent the function $f(x)$ given by $f(x) = \begin{cases} x & ; 0 \leq x \leq \pi \\ 2\pi - x & ; \pi \leq x \leq 2\pi \end{cases}$

Also deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$.

2 Prove that in the interval $(-\pi, \pi)$, $x \cos x = -\frac{1}{2} \sin x + 2 \sum_{n=2}^{\infty} \frac{n(-1)^n}{n^2 - 1} \sin nx$.

Q:4.a Discuss about Practical Harmonic analysis in Fourier series. 07

OR

Q:4.a State and prove Parseval's formula. 07

Q:4.b Attempt any one. 08

1 The displacement y of a part of mechanism is tabulated with corresponding angular movement x° of a crank. Express y as a F.S. neglecting the harmonics above the third:

x°	0	30	60	90	120	150	180	210	240	270	300	330
y	1.80	1.10	0.30	0.16	1.50	1.30	2.16	1.25	1.30	1.52	1.76	2.00

2 Find complex form of the Fourier series of the $f(x) = \cos x$; $-\pi < x < \pi$.