

# First Quiz A

## Q.1 [MCQ, 3 marks, Put the correct option(s) in the box below]

Which of the following statement(s) is (are) true.

- a) If the fundamental period of f is 2, then the fundamental period of  $f^2$  is also 2.
- b) The function  $f:[0,1]\to\mathbb{R}$  defined as  $f(x)=x\cos(\frac{1}{x}),\ x\neq 0$  and f(0)=0, is piecewise continuous.
- c) The function  $f:[0,1]\to\mathbb{R}$  defined as  $f(x)=\frac{1}{n},$  on  $x\in(\frac{1}{n+1},\frac{1}{n}],\ \forall n\in\mathbb{N}$  and f(0)=0, is piecewise continuous.
- d) None of the above.

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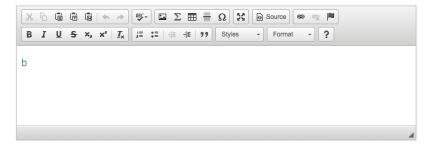
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## Q.2 [MCQ, 3 marks, Put the correct option(s) in the box below]

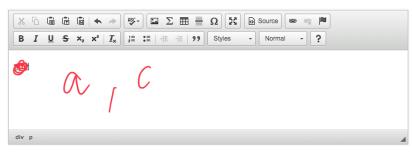
Consider the function  $f(x) = x + x^4$  on [0, 2]. Let h(x) and g(x) denote its Fourier even series and odd series respectively. Then

- a) h(3) = 2
- b) h(3) = -48
- c) g(3) = -2
- d) g(3) = 48
- e) None of the above.

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#### Q.3 [MCQ, 3 marks, Put the correct option(s) in the box below]

Consider the function f(x) = |sin(x) + cos(x)| on real line. Then,

- a) f is a periodic function.
- b) fundamental period of f is  $2\pi$ .
- c) f is a differentiable function.

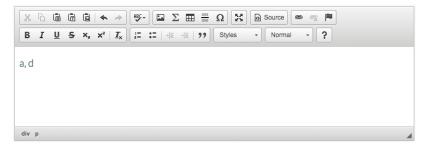
d) fundamental period of f is  $\pi$ 

e) None of the above.

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## Q.4 [Descriptive question, 5 Marks]

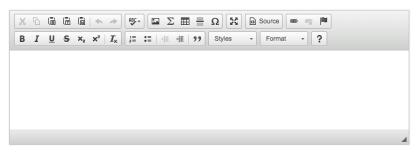
Consider the function defined by f(x) = -x, on  $x \in (-\pi, 0)$ , and  $f(x) = x - \pi$  on  $x \in [0, \pi)$ .

- 1. Calculate the Fourier coefficients  $a_0$ ,  $a_n$  and  $b_n$ , of f.
- 2. Hence find the value of the series  $1+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}+\frac{1}{9^2}+\cdots$

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#### Q.5 [Descriptive Question, 5 Marks]

Consider the function f(x)=1 on  $(-\frac{\pi}{2},\frac{\pi}{2})$ , and f(x)=0 on  $[-\pi,-\frac{\pi}{2}]\cup[\frac{\pi}{2},\pi]$ . Using this function find the value of the following series:

$$\sum_{n=1}^{\infty} \frac{\sin^2(\frac{n\pi}{2})}{n^2}$$

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