Multiple Choice Questions

Fourier series

Question 1	Fourier coefficient a_0 in the Fourier series $\frac{a_0}{2}+\sum_{n=1}^{\infty}\left(a_n\cos nx+b_n\sin nx\right)$ of $f(x)=e^{-x};\ 0\le x\le 2\pi$ and $f(x+2\pi)=f(x)$ is
Option A	$\frac{1}{\pi}\left(1-e^{-2\pi}\right)$
Option B	$\frac{1}{2\pi}\left(1-e^{2\pi}\right)$
Option C	$\frac{2}{\pi}\left(e^{-2\pi}-1\right)$
Option D	$\frac{1}{\pi}\left(1+e^{2\pi}\right)$
Option E	
Correct Answer	A
Question 2	Fourier coefficient a_0 in the Fourier series $\frac{a_0}{2}+\sum_{n=1}^{\infty}\left(a_n\cos nx+b_n\sin nx\right)$ of $f(x)=x\sin x;\ 0\le x\le 2\pi$ and $f(x+2\pi)=f(x)$ is
Option A	+2
Option B	0
Option C	−2
Option D	-4
Option E	
Correct Answer	**C**
Question 3	$f(x)=x,\ -\pi\le x\le\pi$ and period is 2π. Fourier series is represented by $\frac{a_0}{2}+\sum_{n=1}^{\infty}\left(a_n\cos nx+b_n\sin nx\right)$, then Fourier coefficient b_1 is

Option A	2
Option B	-1
Option C	0
Option D	$\frac{2}{\pi}$
Option E	
Correct Answer	**A**
Question 4	For Half range cosine series of $f(x)=\sin x,\ 0\le x\le \pi$ and period is 2π. Fourier series is represented by $\frac{a_0}{2}+\sum_{n=1}^{\infty} a_n \cos nx$, then Fourier coefficient a_0 is
Option A	4
Option B	2
Option C	$\frac{2}{\pi}$
Option D	$\frac{4}{\pi}$
Option E	
Correct Answer	**D**

Question 5	Fourier series representation of periodic function

	$f(x)=\pi^2-x^2,\ -\pi\le x\le\pi$ is $\pi^2-x^2=\frac{2\pi^2}{3}+4\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n^2}\cos nx$, then value of $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\cdots\cdots=$
Option A	$\frac{\pi^2}{3}$
Option B	$\frac{\pi^2}{4}$
Option C	$\frac{\pi^2}{6}$
Option D	$\frac{\pi^2}{12}$
Option E	
Correct Answer	**D**

Question 6	The value of a_n in the Fourier series $\frac{a_0}{2}+\sum_{n=1}^{\infty}(a_n\cos nx+b_n\sin nx)$ of f(x) = $\left\{\begin{matrix} Cos\,x:\ -\pi\ <x<0 \\ -Cosx:\ 0\ <x<\pi \end{matrix}\right\}$ is
Option A	$((-1)^n)$ / n
Option B	1/ n
Option C	$((-1)^n)/(n^2\text{-}1)$
Option D	0
Option E	
Correct Answer	**D**
Question 7	The Fourier series for the function f(x) = $\left\{\begin{matrix} 1+\frac{2x}{\pi};-\pi\ \le x\le 0 \\ 1-\frac{2x}{\pi}\ ;0\ \le x\le\pi \end{matrix}\right\}$ Contains only
Option A	*Sine term*
Option B	Cosine term
Option C	Sine and cosine term

Option D	*None of these*
Option E	
Correct Answer	**B**
Question 8	The graph of odd function is symmetric about
Option A	Opposite quadrant
Option B	x-axis
Option C	y-axis
Option D	*none of these*
Option E	
Correct Answer	**A**
Question 9	If f(x)=xsinx in the interval $0 \leq x \leq 2\pi$ then the fourier coeffitient $a_{0/2}$ in $\frac{a_0}{2}+\sum_{n=1}^{\infty}\left(a_n \cos nx + b_n \sin nx\right)$ is
Option A	-2
Option B	-1
Option C	0
Option D	π
Option E	
Correct Answer	**B**
Question 10	An example for a function which neither even nor odd
Option A	xsinx
Option B	e^{ax}
Option C	cosx
Option D	*None of these*

Option E	
Correct Answer	**B**
Question 11	If f(x) = $2x - x^2$ in 0<=x<=3 then fourier coeffitient a_0 in $\frac{a_0}{2}+\sum_{n=1}^{\infty}\left(a_n \cos nx + b_n \sin nx\right)$ is
Option A	1
Option B	0
Option C	π
Option D	3
Option E	
Correct Answer	**B**
Question 12	The fourier co-effitient a_n in $\frac{a_0}{2}+\sum_{n=1}^{\infty}\left(a_n \cos nx + b_n \sin nx\right)$ for f(x)=x^2 in the interval $-1 \leq x \leq 1$ is
Option A	$\frac{(-1)^n 4}{n^2\pi^2}$
Option B	$\frac{(-1)^{n+1} 4}{n^2\pi^2}$
Option C	$\frac{4}{n^2\pi^2}$
Option D	$-\frac{4}{n^2\pi^2}$
Option E	
Correct Answer	**A**
Question13	If $f(x) = \sqrt{2}\sin\frac{x}{2}$ and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n \cos nx + b_n \sin nx)$ then a_0 is
A	$\frac{4\sqrt{2}}{\pi}$
B	$\frac{2\sqrt{2}}{\pi}$
C	$-\frac{4\sqrt{2}}{\pi}$

D	$\frac{4\sqrt{3}}{\pi^2}$
E	
Correct Answer	A
Question 14	$f(x)=\begin{cases}-\pi & 0<x<\pi \\ (x-\pi) & \pi<x<2\pi\end{cases}$ and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ then a_0 is
A	$\frac{3\pi}{2}$
B	$\frac{\pi}{2}$
C	$-\frac{\pi}{2}$
D	π
E	
Correct Answer	C
Question 15	$f(x)=\begin{cases}0 & -\pi<x<0 \\ e^{a\pi} & 0<x<\pi\end{cases}$ and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ then a_0 is
A	$\frac{e^{a\pi}-1}{a\pi}$
B	$\frac{1-e^{a\pi}}{a\pi}$
C	$\frac{e^{-a\pi}-1}{a\pi}$
D	$\frac{e^{a\pi}+1}{a\pi}$
E	
Correct Answer	A
Question 16	$f(x)=\begin{cases}0 & -\pi<x<0 \\ \cos x & 0<x<\pi\end{cases}$ and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ then a_1 is
A	$\frac{1}{2}$
B	-1

C	$-\frac{1}{2}$
D	1
E	
Correct Answer	A
Question 17	$f(x)=\begin{cases}0 & -\pi<x<0\\ \cos x & 0<x<\pi\end{cases}$ and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ then a_0 is
A	0
B	1
C	2
D	3
E	
Correct Answer	A
Question 18	$f(x)=\begin{cases}\sin x & -\pi<x<0\\ \cos x & 0<x<\pi\end{cases}$ and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ then a_0 is
A	$\frac{\pi}{3}$
B	$\frac{\pi}{4}$
C	$-\frac{2}{\pi}$
D	$\frac{3}{\pi}$
E	
Correct Answer	C
Question 19	$f(x)=\begin{cases}\pi+x & -\pi<x<0\\ \pi-x & 0<x<\pi\end{cases}$ is an even and f(x+2 π) = f(x) then a_0 is
A	π
B	$\frac{\pi}{2}$
C	$\frac{\pi}{3}$
D	$\frac{\pi}{4}$
E	
Correct Answer	A
Question 20	$f(x)=\begin{cases}\cos x & -\pi<x<0\\ -\cos x & 0<x<\pi\end{cases}$ and f(x+2 π) = f(x) which is odd function then b_1

A	Π
B	0
C	- π
D	1
E	
Correct Answer	B
Question 21	$f(x) = \cosh ax \quad -\pi < x < \pi$, & f(x+2 π) = f(x) then a_0 is
A	$\frac{\sinh a\pi}{a\pi}$
B	$\frac{2\sinh a\pi}{a\pi}$
C	$\frac{\sinh a\pi}{a^2\pi^2}$
D	$\frac{2\sinh a\pi}{a^2\pi^2}$
E	
Correct Answer	B
Question 22	$f(x) = \pi^2 - x^2 \quad -\pi < x < \pi$, & and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2} + \sum (a_n \cos nx + b_n \sin nx)$ then a_0 is
A	$\frac{4\pi^2}{3}$
B	$\frac{4\pi}{3}$
C	$-\frac{3\pi^2}{4}$
D	$\frac{3\pi}{4}$
E	
Correct Answer	A
Question23	$f(x) = x - x^3 \quad -\pi < x < \pi$ & and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2} + \sum (a_n \cos nx + b_n \sin nx)$ then a_0 is
A	$\pi - \frac{\pi^3}{2}$
B	$\frac{\pi^3}{2} - \pi$
C	$-\pi + \frac{\pi^3}{2}$

D	$-\pi-\frac{\pi^3}{2}$
E	
Correct Answer	A
Question 24	$f(x)=x^2 \quad -\pi<x<\pi$ and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ then a_0 is
A	$\frac{2\pi^2}{3}$
B	$\frac{\pi^2}{3}$
C	$\frac{3\pi^2}{2}$
D	$\frac{\pi^2}{2}$
E	
Correct Answer	A
Question 25	$f(x)=x \quad -\pi<x<\pi$ and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ then b_1 is
A	1
B	-1
C	2
D	-2
E	
Correct Answer	C
Question 26	$f(x)=\begin{cases}\pi x & 0\le x\le 1\\ \pi(2-x) & 1\le x\le 2\end{cases}$ and Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos\frac{n\pi x}{l}+b_n\sin\frac{n\pi x}{l})$ then a_0 is
A	π
B	$-\pi$
C	$\frac{\pi}{2}$
D	$\frac{2}{\pi}$
E	
Correct Answer	A
Question 27	$f(x)=4-x^2 \quad 0<x<2,\ period\ 2$ and Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos\frac{n\pi x}{l}+b_n\sin\frac{n\pi x}{l})$ then a_0 is

A	$\frac{4}{3}$
B	$\frac{16}{3}$
C	$\frac{9}{4}$
D	$\frac{3}{4}$
E	
Correct Answer	B
Question 28	$f(x)=\begin{cases}0 & -5<x<0\\ 3 & 0<x<5\end{cases}$, *period* 10 and Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos\frac{n\pi x}{l}+b_n\sin\frac{n\pi x}{l})$ then a_0 is
A	1
B	5
C	3
D	4
E	
Correct Answer	C
Question 30	$f(x)=\begin{cases}0 & -5<x<0\\ 3 & 0<x<5\end{cases}$, *period* 10 and Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos\frac{n\pi x}{l}+b_n\sin\frac{n\pi x}{l})$ then a_n is
A	0
B	1
C	2
D	3
E	
Correct Answer	A
Question 31	$f(x)=\begin{cases}0 & -5<x<0\\ 3 & 0<x<5\end{cases}$, *period* 10 and Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos\frac{n\pi x}{l}+b_n\sin\frac{n\pi x}{l})$ then b_n is
A	$\frac{3(1-\cos n\pi)}{n\pi}$
B	$\frac{3(1+\cos n\pi)}{n\pi}$
C	$\frac{3(1-\sin n\pi)}{n\pi}$
D	$\frac{3(1+\sin n\pi)}{n\pi}$
E	

Correct Answer	A
Question 32	Fourier series expansion of $x^2 = \frac{l^2}{3} + \frac{4l^2}{\pi^2}\sum_{n=1}^{\infty}\frac{(-1)^2}{n^2}\cos\frac{n\pi x}{l}$ then $\frac{\pi^2}{12} =$
A	$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots\ldots$
B	$\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \ldots\ldots$
C	$\frac{1}{2^2} - \frac{1}{4^2} + \frac{1}{6^2} + \ldots\ldots$
D	$\frac{1}{1^2} - \frac{1}{3^2} + \frac{1}{5^2} - \frac{1}{7^2} + \ldots\ldots$
E	
Correct Answer	A
Question 33	Fourier series expansion of $x^2 = \frac{l^2}{3} + \frac{4l^2}{\pi^2}\sum_{n=1}^{\infty}\frac{(-1)^2}{n^2}\cos\frac{n\pi x}{l}$ then $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots\ldots =$
A	$\frac{\pi^2}{8}$
B	$\frac{\pi^2}{12}$
C	$\frac{\pi^3}{3}$
D	$\frac{\pi^2}{4}$
E	
Correct Answer	B
Question 34	$f(x) = \begin{cases} 1 & -1 < x < 0 \\ \cos \pi x & 0 < x < 1 \end{cases}$ $period\ 2$ and Fourier series of f(x) is represented by $\frac{a_0}{2} + \sum(a_n \cos\frac{n\pi x}{l} + b_n \sin\frac{n\pi x}{l})$ then a_0 is
A	1
B	-1
C	2
D	-2
E	
Correct Answer	A
Question 35	$f(x) = \begin{cases} 1 & -2 < x < 0 \\ -1 & 0 < x < 2 \end{cases}$ $period\ 4$ and Fourier series of f(x) is represented by $\frac{a_0}{2} + \sum(a_n \cos\frac{n\pi x}{l} + b_n \sin\frac{n\pi x}{l})$ then a_0 is

A	1
B	0
C	2
D	-2
E	
Correct Answer	B
Question 36	$f(x)=\begin{cases}1 & -1<x<0\\ \cos\pi x & 0<x<1\end{cases}$ $period\ 2$ & Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos\frac{n\pi x}{l}+b_n\sin\frac{n\pi x}{l})$ then b_1 is
A	$-\frac{2}{\pi}$
B	$\frac{2}{\pi}$
C	$\frac{3}{\pi}$
D	$\frac{2\pi}{3}$
E	
Correct Answer	A
Question 37	$f(x)=\begin{cases}1 & -2<x<0\\ -1 & 0<x<2\end{cases}$ $period\ 4$ & Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos\frac{n\pi x}{l}+b_n\sin\frac{n\pi x}{l})$ then a_0 is
A	1
B	-1
C	0
D	2
E	
Correct Answer	C
Question 38	$f(x)=\sin x \quad 0\le x\le\pi$, and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ then a_0 is
A	$\frac{4}{\pi}$
B	$\frac{\pi}{4}$
C	$\frac{2}{\pi}$
D	$\frac{\pi}{2}$
E	
Correct Answer	A

Question 39	$f(x)=\begin{cases}0 & -\pi<x<0\\ \cos x & 0<x<\pi\end{cases}$ and f(x + 2π) = f(x). Fourier series of f(x) is represented by $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ then b_1 is
A	0
B	1
C	2
D	3
E	
Correct Answer	A

Question 40	For the Fourier Series $\frac{a_0}{2}+\sum(a_n\cos nx+b_n\sin nx)$ of the function f(t) $=\begin{cases}0 \ if & -2<t<-1\\ k \ if & -1<t<1\\ 0 \ if & 1<t<2\end{cases}$ the value of a_o is
Option A	k
Option B	2k/3
Option C	k/4
Option D	k /2
Option E	
Correct Answer	**D**