# Mathematics-II – X20001

(2nd Sem Civil PDDC 2013)

Assignment-2, Laplace Transforms

| Sr. No. | Questions |
|---|---|
| 1 | Write down all formula of laplace transformation. |
| 2 | Write down all formula of Inverse laplace transformation. |
| 3 | Find the Laplace transformation of the following functions.<br>$i) a+bt+ct^2$<br>$ii) \sin \pi t$<br>$iii) \sin 2t.\cos 2t$<br>$iv) e^t \cosh 3t$<br>$v) 2.e^{-t} \cos^2 \frac{1}{2}t$ |
| 4 | Find Inverse Laplace transform of the following functions.<br>$i) \frac{0.1s+0.9}{s^2+3.24}$<br>$ii) \frac{-s-10}{s^2-s-2}$<br>$iii) \frac{1-7s}{(s-3)(s-1)(s+2)}$<br>$iv) \frac{s^4-6s-18}{s^5-3s^4}$<br>$v) \frac{12}{(s-3)^4}$<br>$vi) \frac{2}{s^2+s+\frac{1}{2}}$ |
| 5 | Solve the following initial value problems by the laplace transform.<br>$i) y'+3y=10\sin t; y(0)=0$<br>$ii) y''-y'-2y=0; y(0)=8, y'(0)=7$<br>$iii) y''-4y'+3y=6t-8; y(0)=0, y'(0)=0$<br>$iv) y''+2y'-3y=6e^{-2t}; y(0)=2, y'(0)=-14$ |
| 6 | Find the Inverse laplace transformation by Partial fractions.<br>$i) \frac{6}{(s+2)(s-4)}$<br>$ii) \frac{s^2+9s-9}{s^3-9s}$<br>$iii) \frac{2s^3}{s^4-81}$<br>$iv) \frac{s}{(s+1)^2}$ |

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(2nd Sem Civil PDDC 2013)

Assignment-3, Laplace Transforms

| Sr. No. | Questions |
|---|---|
| 1 | Find Inverse Transforms by Integration.<br>$i)\frac{1}{s^2+4s}$<br>$ii)\frac{\pi^5}{s^4(s^2+\pi^2)}$<br>$iii)\frac{4}{s^3-2s^2}$<br>$iv)\frac{1}{s^2}\left(\frac{s-1}{s+1}\right)$ |
| 2 | Find Laplace Transforms by differentiation.<br>$i)3t\sinh 4t$<br>$ii)t^2\cos wt$<br>$iii)te^{-t}\sin t$<br>$iv)t^2\sin 2t$ |
| 3 | Find Inverse transforms by differentiation or integration.<br>$i)\frac{1}{(s-3)^3}$<br>$ii)\frac{s}{(s^2-9)^2}$<br>$iii)\frac{s}{(s^2+4)^2}$<br>$iv)\ln\left(\frac{s+a}{s+b}\right)$ |
| 4 | Calculate. (convolution)<br>$i)1*\sin wt$<br>$ii)\sin wt*\cos wt$<br>$iii)e^t*e^{-t}$<br>$iv)t*e^t$ |
| 5 | Find the Inverse laplace transform by convolution theorem.<br>$i)\frac{6}{s(s+3)}$<br>$ii)\frac{1}{s^2(s-1)}$ $iii)\frac{s}{(s^2+\pi^2)^2}$<br>$iv)\frac{1}{(s+3)(s-2)}$ $v)\frac{w}{s^2(s^2+w^2)}$ |

# Mathematics-II – X20001

(2nd Sem Civil PDDC 2013)

Assignment-3, Fourier Series

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|---|---|
| Q.1 | Find the Fourier Series for $f(x)=e^{-x}$ in the interval $0<x<2\pi$. |
| Q.2 | Expand $f(x)=x\sin x$ as a Fourier series in the interval $0<x<2\pi$. |
| Q.3 | Find the Fourier series for $f(x)=\begin{cases}0 & -\pi\le x\le 0\\ \sin x & 0\le x\le\pi\end{cases}$. Hence deduce that $\frac{1}{1\cdot 3}+\frac{1}{3\cdot 5}+\frac{1}{5\cdot 7}+\ldots=\frac{1}{4}(\pi-2)$. |
| Q.4 | Find the Fourier series of the function $f(x)=\begin{cases}x^2 & 0\le x\le\pi\\ -x^2 & -\pi\le x\le 0\end{cases}$. |
| Q.5 | Find the Fourier series of $f(x)=2x-x^2$ in the interval (0,3). Hence deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\ldots=\frac{\pi^2}{12}$. |
| Q.6 | Find the Fourier series of the function $f(x)=\begin{cases}\pi x & 0<x<1\\ 0 & x=1\\ \pi(x-2) & 1<x<2\end{cases}$. Hence show that $\frac{1}{1}-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\ldots=\frac{\pi}{4}$. |
| Q.7 | Find the Fourier series of $f(x)=x^2$ in the interval $0<x<a$, $f(x+a)=f(x)$. |
| Q.8 | If $f(x)=\lvert\cos x\rvert$, expand $f(x)$ as a Fourier series in the interval $(-\pi,\pi)$, $f(x+2\pi)=f(x)$. |
| Q.9 | For the function $f(x)$ defined by $f(x)=\lvert x\rvert$, in the interval $(-\pi,\pi)$. Obtain the Fourier series. Deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots=\frac{\pi^2}{8}$. |
| Q.10 | Given $f(x)=\begin{cases}-x+1 & -\pi\le x\le 0\\ x+1 & 0\le x\le\pi\end{cases}$. Is the function even of odd? Find the Fourier series for $f(x)$ and deduce the value of $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots$. |

# Mathematics-II – X20001

(2nd Sem Civil PDDC 2013)

Assignment-4, Fourier Series

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|---|---|
| Q.1 | Find the Fourier series of the periodic function $f(x)$; $f(x)=-k$ when $-\pi<x<0$ and $f(x)=k$ when $0<x<\pi$, and $f(x+2\pi)=f(x)$. |
| Q.2 | Half range sine and cosine series of $f(x)=x(\pi-x)$ in $(0,\pi)$ |
| Q.3 | Find the Fourier series for the function $f(x)=\begin{cases}\pi x, 0<x<1\\ \pi(x-2), 1<x<2\end{cases}$ |
| Q.4 | Find the Fourier series for f(x) defined by f(x) = $x+\frac{x^2}{4}$ when $-\pi<x<\pi$ and<br>$f(x+2\pi)=f(x)$ and hence show that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\ldots\ldots=\frac{\pi^2}{12}$ |
| Q.5 | Find the Fourier series for the function $f(x)=\begin{cases}x; 0<x<1\\ 0; 1<x<2\end{cases}$. |
| Q.6 | If f(x) = x in $0<x<\frac{\pi}{2}$<br>$=\pi-x$ in $\frac{\pi}{2}<x<\frac{3\pi}{2}$<br>$=x-2\pi$ in $\frac{3\pi}{2}<x<2\pi$<br>Prove that $f(x)=\frac{4}{\pi}\left\{\frac{\sin x}{1^2}-\frac{\sin 3x}{3^2}+\frac{\sin 5x}{5^2}-\right\}$ |
| Q.7 | If $f(x)=\frac{x}{l}$ when $0<x<l$<br>$=\frac{2l-x}{l}$ when $l<x<2l$ |
| | Prove that $f(x)=\frac{1}{2}-\frac{4}{\pi^2}\left(\frac{1}{l^2}\cos\frac{\pi x}{l}+\frac{1}{3^2}\cos\frac{3\pi x}{l}+\frac{1}{5^2}\cos\frac{5\pi x}{l}+\ldots\ldots\right)$ |
| Q.8 | When x lies between $\pm\pi$ and p is not an integer, prove that<br>$\sin px=\frac{2}{\pi}\sin p\pi\left(\frac{\sin x}{1^2-p^2}-\frac{2\sin 2x}{2^2-p^2}+\frac{3\sin 3x}{3^2-p^2}-\ldots\ldots\right)$ |
| Q.9 | Find the Fourier series for the function $f(x)=e^{ax}$ in $(-l,l)$ |
| Q.10 | Half range sine and cosine series of $f(x)=2x-1$ in $(0,1)$ |
| Q.11 | Half range sine and cosine series of $x^2$ in $(0,\pi)$ |
| Q.12 | Find Half range sine and cosine series for $f(x)=(x-1)^2$ in $(0,1)$ |