Code No: R10202/R10

## Set No. 1

I B.Tech II Semester Supplementary Examinations, July. 2015 MATHEMATICS- II
( Common to Civil Engineering, Electrical \& Electronics Engineering, Mechanical Engineering, Electronics \& Communication Engineering, Computer Science \& Engineering, Chemical Engineering, Electronics \& Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics \& Computer Engineering, Aeronautical Engineering, Bio-Technology, Automobile Engineering, Mining and Petroliem Technology)
Time: 3 hours
Max Marks: 75
Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find the Laplace transform of
$e^{2 t}+e^{-5 t}+4 \sin 4 t-\cos 5 t+\sinh 3 t-2 \cosh 2 t+t^{7}+9$
(b) Find the Laplace transform of $\mathrm{e}^{5 t} \sin 2 \mathrm{t} \cos 2 \mathrm{t}$
2. (a) Find $L^{-1}\left\{\frac{\left(s^{2}-1\right)}{\left(s^{2}+1\right)^{2}}\right\}$.
(b) Using Laplace transforms, solve $\left(D^{2}+1\right) x=t \cos 2 t$, given that $x=\frac{d x}{d t}=0$ at $t=0$.
3. Find the half range Fourier cosine series of $f(x)=\sin (\pi x / L)$ in the range $0<x<L$
4. Find the fourier sine transform of $f(x)$ defined by $f(x)=1 / x\left(x^{2}+a^{2}\right)$ And hence find fourier cosine transform of $f(x)=1 / a^{2}+x^{2}$
5. (a) Form the Partial Differential Equation by eliminating arbitrary function from $\phi$ $(x y z, x+y+z)=0$
(b) Solve $x p-y q=x z$
6. A bar AB of length 10 cm has its ends A and B kept at $30^{\circ} \mathrm{C}$ and $100^{\circ} \mathrm{C}$ temperatures respectively, until steady state condition is reached. Then the temperature at A is reduced to $20^{\circ} \mathrm{C}$ and that at B to $40^{\circ} \mathrm{C}$ and these temperatures are maintained. Find the subsequent temperature distribution.
7. (a) Solve the difference equation
$6 \mathrm{u}_{\mathrm{n}+2}-u_{n+1}-u_{n}=0$, given that $\mathrm{u}_{0}=0, u_{1}=1$ by Z-transforms.
(b) Solve the difference equation $4 u_{n}-u_{n+2}=0$, given that $u_{0}=0, u_{1}=2$ by Z-transforms.
8. (a) Evaluate $\int_{0}^{1} \mathrm{x}^{3} \sqrt{1-\mathrm{x}} d x$, using Beta and Gamma functions.
(b) Prove that $\int_{0}^{\infty} \mathrm{x}^{2 \mathrm{n}-1} e^{-a x^{2}} d x=\frac{\Gamma(n)}{2 a^{n}}$, a $>0, \mathrm{n}>0$.

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Time: 3 hours
Max Marks: 75
Answer any FIVE Questions
All Questions carry equal marks

1. (a) Find $L\left(t^{2} e^{t} \cos 2 t\right)$
(b) Find $L\left(\frac{e^{-a t}-e^{-b t}}{t}\right)$
2. (a) Find $L^{-1}\left\{\frac{s+1}{(s+2 s+2)^{2}}\right\}$.
(b) Find $L^{-1}\left\{\frac{1}{\left(s^{2}-1\right)\left(s^{2}+25\right)}\right\}$ using convolution theorem.
3. Find a fourier expansion of $f(x)=x \cos x, 0<x<2 \pi$
4. Find the inverse fourier sine transform of $\mathrm{f}(\mathrm{x})$ of $\left[\mathrm{F}_{s}(\mathrm{p})\right]=\mathrm{p} / 1+\mathrm{p}^{2}$
5. (a) Solve $p^{2}+q^{2}=x^{2}+y^{2}$
(b) Solve $(x-a) p+(y-b) q=z-c$
6. A tightly stretched string with fixed points $\mathrm{x}=0$ and $\mathrm{x}=l$ is initially at rest in its equilibrium position. If it is set vibrating by giving to each of its points a velocity $\frac{d y}{d t}=3\left(l x-x^{2}\right)$ at $\mathrm{t}=0$, find $\mathrm{y}(\mathrm{x}, \mathrm{t})$.
7. (a) Find the inverse Z-transform of $\frac{z}{(z-1)(z-2)}$
(b) Determine $u_{2}$ where $U(z)=\frac{2 z^{2}+3 z+4}{(z-3)^{3}}, \quad|z|>3$
8. (a)Show that $\int_{0}^{\infty} \mathrm{x}^{\mathrm{m}} e^{-a x^{n}} d x=\frac{1}{n \frac{m+1}{n}} \Gamma\left(\frac{m+1}{n}\right)$ where $\mathrm{m}, \mathrm{n}$ are positive constants.
(b) Evaluate $4 \int_{0}^{\infty} \frac{\mathrm{x}^{2}}{1+x^{4}} d x$ using beta and gamma functions.

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## Set No. 3

I B.Tech II Semester $\begin{gathered}\text { Supplementary Examinations, July. } 2015 \\ \text { MATHEMATICS- II }\end{gathered}$
( Common to Civil Engineering, Electrical \& Electronics Engineering, Mechanical Engineering, Electronics \& Communication Engineering, Computer Science \& Engineering, Chemical Engineering, Electronics \& Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics \& Computer Engineering, Aeronautical Engineering, Bio-Technology, Automobile Engineering, Mining and Petroliem Technology)
Time: 3 hours
Max Marks: 75
Answer any FIVE Questions
All Questions carry equal marks

1. (a) Find the Laplace transform of cost $\cos 2 \mathrm{t} \cos 3 \mathrm{t}$
(b) Find the Laplace transform of $\mathrm{f}(\mathrm{t})=\left\{\begin{array}{c}\cos t, 0<t<2 \pi \\ 0, \text { otherwise }\end{array}\right.$
2. (a) Find inverse Laplace transform of $\frac{e^{-2 s}}{s^{2}+4 s+13}$
(b) Find inverse Laplace transform of $\frac{s}{2 s^{2}-8}$
3. Expand $f(x)=3 x^{2}-2$ as a fourier series in $(-3,3)$
4. Find the finite fourier sine and cosine transform of
$\mathrm{f}(\mathrm{x})=\mathrm{x}, 0=\mathrm{x}=\pi / 2$,
$\mathrm{f}(\mathrm{x})=\pi-\mathrm{x}, \pi / 2=\mathrm{x}=\pi$
5. (a) Solve $x p+y q=z$
(b) Solve $\frac{\mathrm{p}}{\mathrm{x}^{2}}+\frac{q}{y^{2}}=\frac{1}{z^{2}}$
6. A bar of length 30 cm . has its ends A and B maintained at $60^{\circ} \mathrm{C}$ and $0^{\circ} \mathrm{C}$ respectively until steady state conditions prevailed. Then the end B is suddenly insulated and kept so. The temperature at other end A is reduced to $0^{\circ} \mathrm{C}$ and maintained. And the temperature distribution in the bar.
7. (a) Find $Z^{-1}\left(\frac{3 z^{2}+z}{(5 z-1)(5 z+2)}\right)$.
(b) Find $Z^{-1}\left(\frac{z^{2}-3 z}{(z+2)(z-5)}\right)$
8. (a) Prove that $\Gamma(m) \Gamma\left(m+\frac{1}{2}\right)=\frac{\sqrt{\pi}}{2^{2 m-1}} \Gamma(2 m)$
(b) Prove that $\int_{0}^{\infty} \mathrm{x}^{\mathrm{n}} e^{-a^{2} x^{2}} d x=\frac{1}{2 a^{n+1}} \Gamma\left(\frac{n+1}{2}\right), \mathrm{n}>-1$

## Set No. 4

I B.Tech II Semester Supplementary Examinations, July. 2015
( Common to Civil Engineering, Electrical \& Electronics Engineering, Mechanical Engineering, Electronics \& Communication Engineering, Computer Science \& Engineering, Chemical Engineering, Electronics \& Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics \& Computer Engineering, Aeronautical Engineering, Bio-Technology, Automobile Engineering, Mining and Petroliem Technology)
Time: 3 hours
Max Marks: 75
Answer any FIVE Questions
All Questions carry equal marks

1. (a) Find the Laplace transform of $\cos 3 \mathrm{t} \sin 5 \mathrm{t}$
(b) Find the Laplace transform of $\frac{1-e^{-t}}{t}$
2. (a) Find $L^{-1}\left\{\frac{1}{s} \cdot \cos \frac{1}{s}\right\}$.
(b) Find $L^{-1}\left\{\frac{s}{\left(s^{2}+a^{2}\right)^{2}}\right\}$ using convolution theorem.
3. (a) Find the fourier series of periodicity 3 for $f(x)=2 x-x^{2}$ in $0<x<3$
(b) Expand $f(x)=3 x^{2}-2$ as a fourier series in the interval $(-3,3)$
4. Find the fourier transform of $f(x)$ defined by
$\mathrm{f}(\mathrm{x})=1,|\mathrm{x}|<\mathrm{a}, \mathrm{f}(\mathrm{x})=0,|\mathrm{x}|>\mathrm{a}$ and hence $\int_{0}^{\infty} \frac{\sin 2 \mathrm{ax}}{x^{2}} d x=\frac{\pi a}{2}$
5. (a) Solve $p-q=z-y$
(b) Solve ( $\mathrm{x}-\mathrm{a}$ ) $\mathrm{p}+(\mathrm{y}-\mathrm{b}) \mathrm{q}=\mathrm{Zc}$
6. A long rectangular plate of width ' $a$ ' with insulated surface has its temperature ' $v$ ' equal to zero on both the long sides and one of the short sides so that $v(0, y)=0$, $v(a, y)=0 ; v(x, 8)=0$, and $v(x, 0)=k x$. Find the steady state temperature in the plate.
7. (a) Find the inverse Z-transform of $\frac{4 z^{2}-2 z}{z^{3}-5 z^{2}+8 z-4}$.
(b) Find $\mathrm{Z}[\mathrm{n} \cos \mathrm{n} \theta]$
8. (a) Evaluate $\int_{0}^{\pi / 2} \sin ^{7 / 2} \theta \cos ^{3} 2 \theta d \theta$ using beta and gamma functions.
(b) Show that $\int_{a}^{b}(x-a)^{m-1}(b-x)^{n-1} d x=(b-a)^{m+n-1} \beta(m, n)$.
