Code No: R10202/R10 **Set No. 1**

I B.Tech II Semester Supplementary Examinations, August 2014
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 $\cos^3 3t$
   (b) Find the Laplace transform of f(t) = $|t-1| + |t+1|$, t≥0 [7+8]

2. (a) Find $L^{-1}[s^2/(s^2+4)(s^2+25)]$.
   (b) Find $L^{-1}\{\tan^{-1}(s+1)\}$. [7+8]

3. (a)Find cosine series and sine series for the function f(x)=x^2 in (0,π) find sum of the series $1/1^2$-$1/2^2$+$1/3^2$+....
   (b) Find cosine series and sine series for the function f(x)=π-x in (0,π) [8+7]

4. Find the finite Fourier sine and cosine transform of $f(x) = \frac{\pi}{3} - x + \frac{x^2}{2\pi}$ where 0<x<π [15]

5. (a) Solve $x^2p+y^2q=xz$
   (b) Solve (3y+2z)p+(4z-3z)q = -(2x+4y) [8+7]

6. A homogenous rod of conducting material of length 100 cm has its ends kept at zero temperature and the temperature initially is $u(x,o) = \begin{cases} x; & 0 \le x \le 5 \\ 100 - x; & 50 \le x \le 100 \end{cases}$.
   Find the temperature u(x, t) at any time. [15]

7. (a) Find the inverse Z-transform of $\frac{z^2}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{4}\right)}$
   (b) Evaluate $Z^{-1}\left(\frac{z}{z^2+11z+24}\right)$. [8+7]

8. (a) Evaluate $\int_0^1 x^3 \sqrt{1-x}\, dx$,using Beta and Gamma functions.
   (b) Prove that $\int_0^\infty x^{2n-1} \; e^{-ax^2} dx = \frac{\Gamma(n)}{2a^n}$, a > 0, n > 0. [8+7]

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Code No: R10202/R10 **Set No. 2**

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MATHEMATICS- II
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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
   (i) cos (at+b)
   (ii) sin(at-b)

   (b) Find the Laplace transform of
   (i) e^{4t} cos4t
   (ii) t^4e^{5t} [7+8]

2. (a) Find $L^{-1}\left\{\frac{(s^2-1)}{(s^2+1)^2}\right\}$.

   (b) Using Laplace transforms, solve$(D^2+1)x = t\cos 2t$, given that $x = \frac{dx}{dt} = 0$ at $t = 0$. [7+8]

3. Find the half range Fourier cosine series of f(x)= sin(πx/L) in the range o<x<L [15]

4. (a) Find the fourier transform of f(x)defined by f(x)=x, |x|=a =0, |x|>a

   (b) Find the fourier transform of f(x)defined by f(x)=cos x, |x|=a, f(x) =0, |x|= a >0 [8+7]

5. (a) Solve $p^2+q^2=x^2+y^2$
   (b) Solve yz p − xz q = xy [8+7]

6. A bar 100 cm long with insulated sides has its ends kept at 0^oc and 100^oC respectively until steady state conditions prevail. Then the temperature 0^oc is raised to 30^oc and that of 100^oc is lowered to 60^oc. Find the subsequent temperature distribution. [15]

7. (a) Find the inverse Z-transform of $\frac{z^2}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{4}\right)}$

   (b) Evaluate $Z^{-1}\left(\frac{z}{z^2+11z+24}\right)$. [8+7]

8. (a) Prove that $\Gamma(m)\Gamma\left(m+\frac{1}{2}\right) = \frac{\sqrt{\pi}}{2^{2m-1}}\Gamma(2m)$
   (b) Prove that $\int_0^\infty x^n\ e^{-a^2x^2}dx = \frac{1}{2a^{n+1}}\Gamma\left(\frac{n+1}{2}\right)$,n>-1 [8+7]

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Code No: R10202/R10 **Set No. 3**

I B.Tech II Semester Supplementary Examinations, August 2014
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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
   (i) cosh(at+b)
   (ii) sint(at-b)
   (b) Find the Laplace transform of
   (i) e^{4t} cos4t
   (ii) t^4e^{5t} [7+8]

2. (a) Find $L^{-1}\left[\log\left(\frac{s^2+1}{s^2+9}\right)\right]$.
   (b) Find inverse Laplace transform of $\frac{1}{s(s^2-a^2)}$ [7+8]

3. (a) Express f(x)=x as a half range Fourier cosine series in $(-\pi, \pi)$
   (b) Express f(x)=x^2 as a Fourier series in $(-\pi, \pi)$ [8+7]

4. Find the fourier cosine and sine transform of f(x) defined by f(x) = e^{-ax}/x and hence evaluate that $\int_0^\infty \frac{e^{-ax}-e^{-bx}\ \sin sx\ dx}{x}$ [15]

5. (a) Form the partial differential equation by eliminating arbitrary function from f(x^2+y^2, x^2-z^2)=0
   (b) Solve 2p + 3q = 1 [8+7]

6. The ends A and B of a rod 20cm long have the temperature at 30^oc and 80^oc until steady states prevail. The temperatures of the ends are changed at 40^oc and 60^oc respectively. Find the temperature distribution in the rod at time t. [15]

7. (a) Find the inverse Z-transform of $\frac{z^2}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{4}\right)}$
   (b) Evaluate $Z^{-1}\left(\frac{z}{z^2+11z+24}\right)$. [8+7]

8. (a) Show that $\Gamma(n) = \frac{1}{n}\int_0^\infty e^{-x^{\frac{1}{n}}}dx$, n > 0
   (b) Evaluate $\int_0^1 x^7(1-x)^5dx$ using Beta and Gamma functions. [8+7]

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Code No: R10202/R10

Set No. 4

I B.Tech II Semester Supplementary Examinations, August 2014
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find L(t(3 sin2t – 2 cos2t))
   (b) Find L(t^2 e^{-2t} cost) [7+8]

2. (a) State and prove Convolution theorem for inverse Laplace transform
   (b) Show that f*g=g*f where f(t)=t^3, g(t)=2t [7+8]

3. The intensity of an alternating current after passing through a rectifier is given by f(x) =i_0 sin x for 0= x=π, f(x) = 0 for π = x=2π where i_0=maximum current and the period is 2 π. Express f(x) as a Fourier series [15]

4. Find the Fourier cosine and sine transform of f(x) defined by f(x) = e^{-ax}/x and hence evaluate that $\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x}$ sin sx dx [15]

5. (a) Solve $p^2+q^2=x^2+y^2$
   (b) Solve yz p – xz q = xy [8+7]

6. A tightly stretched string with fixed end points x=0 and x=l is initially at rest in its equilibrium position. If it is vibrating by giving to each of its points a velocity $\lambda x(l-x)$, find the displacement of the string at any distance 'x' from one end at any time 't'. [15]

7. (a) If Z(u_n) = $\overline{u}(z)$, then prove that Z(n u_n) = $-z\frac{d}{dz}\left[\overline{u}(z)\right]$
   (b) Evaluate $Z^{-1}\left(\frac{z^2}{z^2-5z+6}\right)$, using convolution theorem. [8+7]

8. (a) Given $\int_0^\infty \frac{x^{n-1}}{1+x}dx = \frac{\pi}{\sin n\pi}$, show that $\Gamma(n)\ \Gamma(1-n) = \frac{\pi}{\sin n\pi}$ and deduce $\Gamma\left(\frac{1}{4}\right)\Gamma\left(\frac{3}{4}\right)$
   (b) Prove that $\int_0^{\pi/2}\left[\sqrt{\tan\theta}+\sqrt{\sec\theta}\right]d\theta = \frac{1}{2}\Gamma\left(\frac{1}{4}\right)\left\{\Gamma\left(\frac{3}{4}\right)+\frac{\sqrt{\pi}}{\Gamma\left(\frac{3}{4}\right)}\right\}$ [8+7]

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