

I B. Tech II Semester Supplementary Examinations, April/May - 2018
MATHEMATICS-II
 (Com. to All Branches)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions
 All Questions carry **Equal** Marks

1. a) Find (i) $L\{\sinh^2 at\}$ (ii) $L\{\sin 2t \cos 3t\}$. (8M)
- b) Find Laplace transforms of (i) $t \sin at$ (ii) $f(t) = \begin{cases} \cos\left(t - \frac{\pi}{3}\right), & \text{if } t > \frac{\pi}{3} \\ 0, & \text{if } t < \frac{\pi}{3} \end{cases}$ (7M)
2. a) Evaluate $L^{-1}\left\{\frac{s}{(s^2+a^2)(s^2+b^2)}\right\}$ using convolution theorem. (8M)
- b) Find inverse Laplace transform of $\frac{s}{s^4+s^2+1}$. (7M)
3. a) Find the Half range sine series for $f(x) = x(\pi - x)$ in $(0, \pi)$. (8M)
- b) Find the Fourier series of $f(x) = 2x - x^2$ in $[0, 4]$. (7M)
4. a) Find the Fourier transform of $f(x)$ defined by $f(x) = e^{-\frac{x^2}{2}}$, $-\infty < x < \infty$. (8M)
- b) Find the finite Fourier cosine transform of $f(x) = 4x$ in $[0, 1]$. (7M)
5. a) Find a differential equation by eliminating arbitrary constants a, b, c from the equation $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ (8M)
- b) Solve the PDE $(y + z)p + (z + x)q = x + y$. (7M)
6. a) Solve the wave equation $\frac{\partial^2 y}{\partial x^2} = c^2 \frac{\partial^2 y}{\partial t^2}$ subject to (8M)
- (i) $y(0, t) = 0$
- (ii) $y(l, t) = 0$
- (iii) $y(x, 0) = f(x), 0 \leq x \leq l$
- (iv) $\frac{\partial y}{\partial t}(x, 0) = g(x), 0 \leq x \leq l$
- b) Solve the PDE $\frac{\partial u}{\partial x} - 2 \frac{\partial u}{\partial y} = u$ and $u(x, 0) = 3e^{-5x} + 2e^{-3x}$. (7M)

7. a) Show that $\int_0^1 x^m (\log x)^n dx = \frac{(-1)^n n!}{(m+1)^{n+1}}$ (8M)

b) Evaluate $\int_0^{\infty} e^{-\sqrt{x}} x^{\frac{1}{4}} dx$ (7M)

8. a) Find Z transform of (i) $n^2 e^{-an}$ (ii) $e^k \cos k\alpha$. (8M)

b) Solve $u_{n+2} - 2u_{n+1} + u_n = 3n + 5$ using Z-transforms. (7M)