Code No. : **6009/S**

FACULTY OF ENGINEERING

B.E. 2/4 (Civil) I Semester (Suppl.) Examination, July 2014

MATHEMATICS – III (Common to All Excpt. I.T.)

Time: 3 Hours] [Max. Marks: 75

Note:** Answer **all** questions from Part **A,** and **any five** questions from Part **B.

PART – A

1. Form the partial differential equation by eliminating the arbitrary function $z = y^2 + 2\,f\left(\frac{1}{x} + \log y\right)$. **3**

2. Solve $p^2 - q^2 = x - y$. **2**

3. Define even and odd functions with examples. **3**

4. Find a_0 in the Fourier series expansion of $f(x) = x \sin x$ in $[-\pi, \pi]$. **2**

5. Solve $3\frac{\partial u}{\partial t} + 2\frac{\partial u}{\partial x} = u$ with $u(t, 0) = 6\,e^{-t}$. **3**

6. Show that $e^{-at}\sin bx$ is a solution of one dimensional heat equation. **2**

7. Write the Lagrange's formula for unequal intervals. **3**

8. Explain bisection method to find a real root of $f(x) = 0$. **2**

9. State and prove convolution theorem for z-transforms. **3**

10. Prove that $|z|\,\{a^n\} = \frac{z}{z-a}$. **2**

PART – B

11. a) Eliminate ϕ from $\phi\,(x + y + z,\ xyz) = 0$. **5**

    b) Find the complete integral of $p^2q^2\,(px + qy - z) = 2$. **5**

12. a) Find the Fourier series expansion of $f(x) = x$ in $[-\pi, \pi]$ **5**

b) Find the Fourier sine and cosine series for the function $f(x) = 1$ in $0 < a < 2$. **5**

13. Find the solution of the one dimensional heat equation $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ with the boundary conditions $u(0, t) = u(l, t) = 0$ for $t > 0$ and $u(x, 0) = x$ where l is the length of the rod. **10**

14. a) Apply Gauss Seidal method to solve
$2x + y + 6z = 9$, $8x + 3y + 2z = 13$, $x + 5y + z = 7$. **5**

b) Compute $\frac{dy}{dx}$ at $x = 1.5$ for the following data : **5**

x	0	1	2	3	4	5
y	1	2	5	7	14	26

15. a) Find the inverse Z transform of $\frac{z^2}{(z-2)(z-3)}$. **5**

b) Solve $y_{x+2} + y_{x+1} + y_n = z^n$ with $y_0 = y_1 = 0$ using Z – transforms. **5**

16. a) Find the Z–transform of $\{(n+1)^2\}$. **5**

b) Find a real root of $x^5 - 5x^2 + 3 = 0$ by Newton's Raphson method. **5**

17. a) Solve $r = 4t$ by Monge's method. **5**

b) Solve $(y - z)p + (x - y)q = z - x$. **5**