No. of Printed Pages : 3

ET-102

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering) / B.Tech. (Aerospace Engineering)

01455

Term-End Examination

June, 2014

ET-102 : MATHEMATICS – III

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* ***ten*** *questions. All questions carry equal marks. Use of scientific calculator is allowed.*

1. Test for convergence the series

$$\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \ldots\ldots \infty$$ 7

2. Expand $f(x) = \begin{cases} 0, & -\pi < x < 0 \\ \pi - x, & 0 \le x < \pi \end{cases}$

in a Fourier series. 7

3. Solve the equation : $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = e^x \cos 2x.$ 7

4. Solve : $x\frac{dy}{dx} + y = x^2y^2.$ 7

5. The population of a community is known to increase at a rate proportional to the number of people present at time t. If an initial population P_0 has doubled in 5 years, how long will it take to triple ? To quadruple ? 7

6. Determine the poles of the function $f(z) = \frac{1}{(z-1)^2 (z-3)}$ and the residue at each pole. 7

7. Find the transformation which maps the points $-1, 0, 2$ of the z-plane on to $0, 1, \infty$ of the w-plane respectively. 7

8. Write the given number in the form a + ib.

$$\frac{(3-i)(2+3i)}{1+i}$$ 7

9. Find the three cube roots of $z = i$. 7

10. Show that the given function is analytic in an appropriate domain.

$$f(z) = e^x \cos y + i\, e^x \sin y.$$ 7

11. Expand $f(z) = \frac{1}{(z-1)^2 (z-3)}$ in a Laurent series valid for $0 < |z-1| < 2$. 7

12. Find the Laplace transform of $f(t) = (t+1)^3$. 7

13. Find the inverse Laplace transforms of $\left(\frac{1}{s^2 + 3s}\right)$. 7

14. Solve $x(y^2 - z^2)p + y(z^2 - x^2)q - z(x^2 - y^2) = 0$. 7

15. Apply the Routh-Hurwitz Criterion to determine the stability of the systems whose characteristic equations are given by : 7

(i) $s^4 + 5s^3 + 2s + 10 = 0$

(ii) $s^5 - 2s^4 + 2s^3 + 4s^2 - 11s - 10 = 0$