Paper Code: AS-401

Roll No. | | | | | | | | | | |

B.Tech.
(SEM IV) EVEN SEMESTER EXAMINATION, 2015-16
ENGINEERING MATHEMATICS-III

[Time: 3 hrs.] **[Max. Marks: 100]**

Note: - Attempt all questions. All questions carry equal marks.

1. Attempt any Two parts of the following: − **[10x2 = 20]**

(a) Define Analytic function and derive Cauchy − Riemann equations. Find the harmonic conjugate of the function $u(x,y) = x^3 - 3xy^2$, hence determine analytic function.

(b) Evaluate $\int_0^\infty \frac{\cos ax - \cos bx}{x^2}\, dx, a \geq b \geq 0$, by using contour integration.

(c) State and prove Cauchy's residue theorem and Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$, where C is the circle $|z|=3$.

2. Attempt any Two parts of the following: − **[10x2 = 20]**

(a) State and Prove change of scale property for Fourier transform & evaluate Fourier Cosine transform of e^{-x^2}

(b) By using Fourier Transform Prove that $\int_0^\infty \frac{\cos \lambda x}{\lambda^2 + 1}\, d\lambda = \frac{\pi}{2} e^{-x}$, $x \geq 0$.

(c) Define Z − transform. Find Z transform of $c^k \cos h(\alpha k), k \geq 0$.

3. Attempt any Two parts of the following: − **[10x2 = 20]**

(a) If P is the pull required to lift a load W by means of a pulley block, find a linear law of the form $P = mW + c$ conneting P and W, using the following data.

P	12	15	21	25
W	50	70	100	120

where P and W are taken in kg − wt. Compute P when $W = 150$kg − wt.

(b) Define line of regression. The tangent of the angle between the lines of regression y on x and x on y is 0.6 and $\sigma_x = \frac{1}{2}\sigma_y$, find the coefficient of correlation.

(c) Find the moment generating function of the exponential distribution.

$$f(x) = \frac{1}{c} e^{-x/c},\ 0 \leq x \leq \infty, c > 0$$

Hence, find its mean and Standard deviation.

4. Attempt any Two parts of the following: − **[10x2 = 20]**

(a) Discuss the Newton − Raphson method to find the roots of the equation $f(x) = 0$. Find the order of convergency of this method. Evaluate $\sqrt{21}$ corrected to four decimal places by Newton Raphson method.

(b) Find the value of $\sin 52°$ from the following table by Newton's forward formula.

θ°	45°	50°	55°	60°
sin θ°	0.7071	0.7660	0.8192	0.8660

(c) Apply Lagrange's formula to find f(5) given that $f(1) = 2, f(2) = 4, f(3) = 8, f(4) = 16, f(7) = 128$. Explain why the result differs from 2^5

5. Attempt any Two parts of the following: − **[10x2 = 20]**

(a) Using Runge − Kutta method of fourth order, solve $\frac{dy}{dx} = 3x + \frac{1}{2}y$, with $y(0) = 1$ to determine $y(0.1)$ and $y(0.2)$ correct to four decimal places.

(b) Solve the following system of linear equations by Gauss − Seidel method:

$$28x + 4y - z = 32$$
$$2x + 17y + 4z = 35$$
$$x + 3y + 10z = 24$$

correct to four decimal places.

(c) Discuss general quadrature formula. Evaluate $\int_{0.2}^{1.4} (\sin x - \log_e x + e^x)\, dx$ by using Trapezoidal rule.