B. TECH.

THEORY EXAMINATION (SEM-IV) 2016-17

ENGINEERING MATHEMATICS-III

Time : 3 Hours *Max. Marks : 100*

SECTION – A

1. Attempt all parts of the following question: **(2 x 10 = 20)**

(a) Evaluate $\int_C \frac{e^z}{z+1} dz$, where C is the circle $|z| = 2$

(b) Prove that $f(z) = \sinh z$ is analytic

(c) Prove that Modulation theorem $F\{f(x)\cos ax\} = \frac{1}{2}[f(s+a) + f(s-a)]$

(d) Solve the Z-transform: $y_{k+2} + y_{k+1} - 2y_k = 0,\ y_0 = 4\ y_1 = 0$

(e) What is the meaning of Skewness?

(f) Write Normal equation of $y = a + \frac{b}{x}$

(g) Prove that $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$

(h) Find first approximation value of $(17)^{1/3}$ by using Newton Raphson method

(i) Using Picard's method ,find the solution of $\frac{dy}{dx} = 1 + xy$ upto the third approximation when $x(0) = 0$

(j) Find y(0.1) using Euler's method given that $\frac{dy}{dx} = \log(x + y)\quad y(0) = 1.0$

SECTION – B

2. Attempt any five parts of the following question: **(5 x 10 = 50)**

(a) Prove that the function $f(z)$ defined by $f(z) = \begin{cases} \frac{x^3(1+i) - y^3(1-i)}{x^2 + y^2} & z \neq 0 \\ 0 & z = 0 \end{cases}$ is continuous and the C.R. equations are satisfied at the origin, yet $f'(0)$ does not exist.

(b) Using Cauchy Integral formula to evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$,where C is the circle $|z| = 3$.

(c) Find the Fourier cosine transform of $\frac{1}{1+x^2}$ and then find Fourier sine transform of $\frac{x}{1+x^2}$.

(d) Find the multiple linear regression of X_1 on X_2 and X_3 from the data relating to three variables:

X_1	7	12	17	20
X_2	4	7	9	12
X_3	1	2	5	8

(e) Find the root of the equation $e^x = \cos x$ by using Regula-Falsi method correct to four decimal places.

(f) Apply Crout's method and solve the system of equations
$$2x+3y+z=9$$
$$x+2y+3z=6$$
$$3x+y+2z=8$$

(g) Find the value y(1.1) using Runge-Kutta method of fourth order, given that
$\frac{dy}{dx} = y^2 + xy, y(1) = 1.0, take \quad h = 0.05$

SECTION – C

Attempt any two questions of the following: **(2 x 15 = 30)**

3. (i) Show that the function defined by $f(z) = \sqrt{|xy|}$ is not regular at the origin, although Cauchy-Riemann equations are satisfied

(ii) Evaluate: $\int_0^{2\pi} \frac{d\theta}{a+b\sin\theta}$ if $a > |b|$

(iii) Solve by Z-transform: $y_{k+2} - 4y_{k+1} + 3y_k = 5^k$

4. (i) Using the convolution theorem, evaluate $Z^{-1}\left\{\frac{z^2}{(z-1)(z-3)}\right\}$

(ii) If the θ is the acute angle between the two regression lines in the case of two variables x and y, show that $\tan\theta = \frac{1-r^2}{r}.\frac{\sigma_x\sigma_y}{\sigma_x^2+\sigma_y^2}$, where r, σ_x, σ_y have their usual meanings. Explain the significance of the formula when $r = 0$ and $r = \pm 1$

(iii) By using χ^2-test, find out whether there is any association between income level and type of schooling :

Social status Health	**Poor**	**Rich**	**Total**
Below Normal	130	20	150
Normal	102	108	210
Above Normal	24	96	120
Total	256	224	480

5. (i) Find the missing figure in the following table

x	2	3	4	5	6
$f(x)$	45	49.2	54.1	?	67.4

(ii) Find a cubic polynomial which approximates the data:

x	-2	-1	2	3
$y(x)$	-12	-8	3	5

(iii) Find an approximate value of the $\log_e 5$ by calculating to four decimal places by Simpson's $\frac{1}{3}$ rule, given $\int_0^5 \frac{dx}{4x+5}$