[05 – 2207]

II/IV B.E./B.Tech. DEGREE EXAMINATION.

Second Semester

Electronics and Communication Engineering

MATHEMATICS – IV

(Common for all branches)

(Effective from the admitted batch of 2013–2014)

Time : Three hours   Maximum : 70 marks

Part A is compulsory.

Answer any FOUR questions from Part B.

Each question will carry 14 marks.

PART A

1. (a) Is $f(z) = z|z|$ is analytic at the origin. Justify.

    (b) What kind of singularity does the function $f(z) = e^{1/z}$ has at $z = 0$?

    (c) Define critical points of the bilinear transformation.

    (d) Write any two objectives of the sampling.

8. (a) State convolution theorem and use it to evaluate :

$$Z^{-1}\left\{\frac{8z^2}{(2z-1)(4z+1)}\right\}.$$

(b) Solve by using Z-transforms $y_{n+2} + 4y_{n+1} + 3y_n = 3^n$, given that $y_0 = 0$ and $y_1 = 1$.

(e) Write any two properties of F-distribution.

(f) Solve : $y_{n+1} - 2y_n \cos\alpha + y_{n-1} = 0$

(g) Find the Z-transform of $f(n) = \{1, 2, 3, 4\}$. Also find the ROC.

PART B

2. (a) Find the harmonic conjugate of $u = e^{x^2-y^2} \cos 2xy$. Hence find $f(z)$ in terms of z.

(b) If $f(z)$ is an analytic function then prove that
$$\nabla^2 |f(z)|^2 = 4|f'(z)|^2 .$$

3. (a) Evaluate $\int_C \dfrac{z}{z^2+1} \, dz$, where $C : \left|z + \dfrac{1}{2}\right| = 2$.

(b) Expand $f(z) = \dfrac{e^{2z}}{(z-1)^3}$ about $z = 1$ as a Laurent's series. Also find the region of convergence.

4. (a) State residue theorem and use it to evaluate.
$$\int_C \frac{12z-7}{(2z+3)(z-1)^2} \, dz, \text{ where } C : x^2 + y^2 = 4 .$$

(b) Apply the calculus of residues to evaluate
$$\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)} \, dx .$$

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5. (a) In a normal distribution : 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.

(b) Experience had shown that 20% of a manufactured product is of the top quality. In one day's production of 400 articles only 50 are of top quality. Test the hypothesis at 0.05 level.

6. (a) The average breaking strength of the steel rod is specified to be 18.5 thousand pounds. To test this sample of 14 rods was tested. The mean and standard deviation obtained were 17.85 and 1.955 respectively. Is the result of experiment significance?

(b) A die was thrown 264 times with the following frequency results :

No. of appeared on the die :	1	2	3	4	5	6
Frequency:	40	32	28	58	54	52

Test whether the die is unbiased?

7. (a) Solve the difference equation :

$$u_{n+2} - 7u_{n+1} - 8u_n = n(n-1)2^n.$$

(b) If $Z(u_n) = \dfrac{z}{z-1} + \dfrac{z}{z^2+1}$ then find $Z(u_{n+2})$.