

Code: 5GC41

II B.Tech. II Semester Supplementary Examinations February 2022

Complex Variables & Special Functions

(Common to EEE & ECE)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

UNIT-I

1. a) Symmetry of Beta function $B(m, n)=B(n, m)$ 7M

- b) Evaluate $\int_0^1 \frac{x^2}{\sqrt{1-x^5}} dx$ in terms of B function 7M

OR

2. a) Show that $\Gamma(n) = \int_0^1 \left(\log \frac{1}{x} \right)^{n-1} dx, n > 0$ 7M

- b) Evaluate $\int_0^1 \sqrt{\cot u} du$ 7M

UNIT-II

3. a) Show that $f(z) = z + 2\bar{z}$ is not analytic anywhere in the complex plane. 7M

- b) Determine whether the function $2xy + i(x^2 - y^2)$ is analytic. 7M

OR

4. Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |\operatorname{Re} f(z)|^2 = 2|f'(z)|^2$ where $w = f(z)$ is analytic. 14M

UNIT-III

5. Evaluate $\int_c \frac{\log z}{(z-1)^3} dz$ where $c: |z-1| = \frac{1}{2}$ using Cauchy's integral formula 14M

OR

6. Expand $\operatorname{Log} z$ by Taylor's series about $z=1$. 14M

UNIT-IV

7. Find the poles of the function $\frac{z+1}{z^2(z-2)}$ and Residues at the poles 14M

OR

8. a) Find the poles and Residues at each pole $\frac{ze^z}{(z-1)^3}$ 7M

- b) Use Residue theorem to find the number of zeros of the polynomial $z^{10} - 6z^7 + 3z^3 + 1$ if $|z| < 1$ 7M

UNIT-V

9. Show that the image of the hyperbola $x^2 - y^2 = 1$ under the Transformation $w = \frac{1}{z}$ is the Lemniscate $...^2 = \cos 2w$ 14M

OR

10. Show that the function $w = \frac{4}{z}$ transforms the straight line $x=c$ in the z -plane into a circle in the w -plane. 14M

Hall Ticket Number :

R-15

Code: 5G244

II B.Tech. II Semester Supplementary Examinations February 2022

Linear Control Systems

(Electrical and Electronics Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

Marks

UNIT-I

1. a) Explain the effect of feedback in reducing parameter variations. 7M
 b) Derive an expression for the transfer function of a Field controlled DC servo motor. 7M

OR

2. a) Explain the properties of Signal Flow Graph 7M
 b) Derive an expression for the transfer function of an AC servo motor 7M

UNIT-II

3. a) Determine the underdamped response of second order control system subjected to unit step input function 8M
 b) Obtain the rise time, peak time, maximum peak overshoot and settling time of the unit step response of a closed loop control system given by $G(s) = \frac{36}{s^2 + 2s + 36}$ 6M

OR

4. a) Define Type & Order of a System with examples. 4M
 b) Explain about time domain specifications 10M

UNIT-III

5. a) Explain the construction rules for root locus technique. 7M
 b) Test the stability of the system with the following characteristic equation by Routh's test $s^6 + 2s^5 + 8s^4 + 20s^3 + 16s^2 + 16s + 16 = 0$ 7M

OR

6. Sketch the root locus of the system whose open loop transfer function is $G(s) = \frac{K}{s(s+2)(s+4)}$. Find the value of K so that the damping ratio of the closed loop system is 0.5 14M

UNIT-IV

7. Explain bode plots of basic factors of a transfer function. 14M

OR

8. Sketch the Bode plot and find the Phase margin and gain margin for the system $G(s)H(s) = \frac{10s(3+s)}{s(s+2)(s^2+s+2)}$ 14M

UNIT-V

9. a) What is state transition matrix? State and prove its properties. 7M
 b) Derive the expression for transfer function of State Model. 7M

OR

10. Explain design of the basic lead compensator using Bode plot. 14M
