



R18 Regulation

Subject code:2B4BA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, December 2025

SPECIAL FUNCTIONS AND COMPLEX VARIABLES

(Common to EEE & ECE)

Maximum Marks: 70

Date: 16.12.2025

Duration: 3 hours

- Note: 1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Show that $\beta(m, n) = \beta(n, m)$.	2M	1	L1
2	Find the value of $\Gamma(n+1)$, if n is a positive integer.	2M	1	L1
3	If $\phi(x, y) = x^2 - by^2$ is harmonic then find the value of b.	2M	2	L1
4	Show that analytic function with constant imaginary part is constant.	2M	2	L1
5	Evaluate $\int_C (2y + x^2)dx + (3x - y)dy$ where 'c' the parabola $x = 2t, y = t^2 + 3$ joining (0,3) and (2,4).	2M	3	L1
6	Expand e^x about $z=0$ in Taylor's series expansion	2M	3	L1
7	Classify the nature of the function $f(z) = \frac{z - \sin z}{z^5}$	2M	4	L1
8	Find the residues of the function $f(z) = \frac{e^{-z}}{(z-2)^4}$	2M	4	L1
9	Define Bilinear Transformation and give an example.	2M	5	L1
10	Define invariant or fixed points of the Bilinear Transformation.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Prove that $\int_0^1 \frac{x^{m-1}(1-x)^{n-1}}{(x+a)^{m+n}} dx = \frac{\beta(m,n)}{a^n(1+a)^m}$	10M	1	L2
OR				
12	Prove that $\int_0^1 (1-x^n)^{\frac{1}{n}} dx = \frac{1}{2} \frac{\Gamma(\frac{1}{n})^2}{\Gamma(\frac{2}{n})}$	10M	1	L2
13	If $u+v = e^x (\cos y + \sin y)$ then find the analytic function $f(z)$.	10M	2	L2
OR				
14	Derive the C- R equations in polar form.	10M	2	L2
15	State and prove Cauchy's integral theorem.	10M	3	L2
OR				
16	Find the Laurent's expansion of $f(z) = \frac{1}{z^2 - 4z + 3}$ for $1 < Z < 3$.	10M	3	L2

17	Find the poles and residues at each pole of $f(z) = \frac{1-e^z}{z^4}$	10M	4	L2
OR				
18	Evaluate $\int_C \frac{z^2+2z-2}{z(z-4)(z-1)} dz$, where C is $ z = 1.5$	10M	4	L2
19	S.T the relation $w = \frac{5-4z}{4z-2}$ transforms the circle $ z = 1$ into a circle of radius unity in the w -plane.	10M	5	L2
OR				
20	Find the bilinear Transformation that maps the points $(1-2i, 2+i, 2+3i)$ into the points $(2+i, 1+3i, 4)$.	10M	5	L2