4E1218

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B. Tech. IV - Sem. (Main) Exam., May - 2019
BSC Electronics & Communication Engineering
4EC2 – 01 Advanced Engineering Mathematics - II
EC, EI

Time: 3 Hours **Maximum Marks: 120**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

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All questions are compulsory

1 Q.1 Define Analytic function?

2 Q.2 Write C – R (Cauchy – Riemann Equations).

Q.3 Define Mobius Transformations.

1 Q.4 State Cauchy Integral Formula.

Q.5 State Maximum – Modulus theorem.

Q.6 Write Rodrigues formula for Legendre's Functions.

2 Q.7 Show that $J_{1/2}(x)=\sqrt{\frac{2}{\pi x}}\cos x$.

Q.8 Define basis and dimension for vector spaces.

Q.9 Define canonical forms.

2 Q.10 Define orthogonal property for Bessel's functions.

PART – B

(Analytical/Problem solving questions) [5x8=40]

Attempt any five questions

Q.1 Evaluate $\int_C \frac{(1-2z)}{z(z-1)(z-2)}dz$ where C is the circle $|z| = 1.5$ [8]

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Q.2 The intersection of two subspaces W_1 and W_2 of a vector space V(F) is also a subspace of V(F). [8]

Q.3 Examine the nature of the function $f(z) = \frac{x^2y^5(x+iy)}{x^4+y^{10}}$, $z \neq 0$, $f(0) = 0$ in the region including the origin. [8]

Q.4 Show that the transformation $w = \frac{2z+3}{z-4}$ maps the circle $x^2 + y^2 - 4x = 0$ onto the straight line $4u + 3 = 0$ and explain why the curve obtained is not a circle. [8]

Q.5 Verify Cauchy's theorem for the function $z^3 - iz^2 - 5z + 2i$, if C is the circle $|z - 1| = 2$. [8]

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Q.6 Prove that $\frac{1-z^2}{(1-2xz+z^2)^{3/2}} = \sum_{n=0}^{\infty}(2n+1)P_n(x)z^n$ [8]

Q.7 Prove that $\frac{d}{dx}[J_n^2 + J_{n-1}^2] = 2\left[\frac{n}{x}J_n^2 - \frac{n+1}{x}J_{n+1}^2\right]$ [8]

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PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×15=60]**

Attempt any four questions

Q.1 (A) Prove that orthonormal set of vectors in an IPS V(F) is LI. [8]

(B) If W_1 and W_2 are subspace of a vector space V(F), then their linear sum is generated by their union i.e., $W_1 + W_2 = L(W_1 \cup W_2) = \{W_1 \cup W_2\}$ [7]

3 Q.2 State and prove generating function for $J_n(x)$. [15]

Q.3 Prove that $\int_{-1}^{1} P_m(x)P_n(x)dx = \begin{cases} 0 & , \quad \text{if } m \neq n \\ \dfrac{2}{2n+1} & , \quad \text{if } m = n \end{cases}$ [15]

Q.4 (A) Expand $\dfrac{1}{z(z^2 - 3z + 2)}$ in Laurent's series for the regions. [8]

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(i) $0 < |z| < 1$

(ii) $1 < |z| < 2$

(iii) $|z| > 2$

(B) Expand $\dfrac{\sin z}{z-\pi}$ about $z = \pi$ [7]

Q.5 (A) Show that $\int_0^{2\pi} \dfrac{d\theta}{a + b\cos\theta} = \dfrac{2\pi}{\sqrt{a^2+b^2}}$ [7]

(B) Find the bilinear transformation which transforms the points z = 2, i, −2 into the points w = 1, i, −i respectively. [8]
