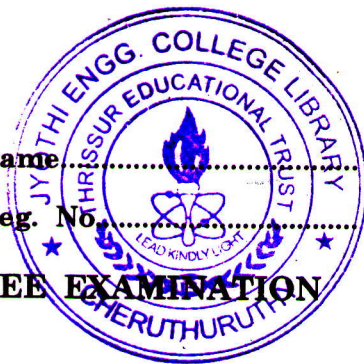


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(Pages : 2)

Name

Reg. No.



**FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
JUNE 2009**

CH 2K 401—ENGINEERING MATHEMATICS—IV

[Common to AI/CE/EC/EE/IC/ME/PE/PM]

Time : Three Hours

Maximum : 100 Marks

Answer all questions.

- I. (a) Is there an analytic function $f(z) = u + iv$ for which $v = e^{y/x}$?
- (b) Find the bilinear transformation that maps 1, i and -1 of the z -plane onto 0, 1 and ∞ of the w -plane.
- (c) Evaluate using Cauchy integral formula $\int_C \frac{z+1}{z^2+2z+4} dz$ where C is the circle $|z+1+i|=2$.
- (d) Obtain the Taylor expansion of $f(z) = \frac{1-z}{z^2}$ in power of $(z-1)$.
- (e) Find $P_3(x)$ using Rodrigule formula.
- (f) Prove that $J_{-1/2}(x) = \sqrt{\frac{2}{\pi x}} \cos x$.
- (g) Write down the possible solution of one dimensional wave equation $\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 z}{\partial x^2}$.
- (h) Solve $2x \frac{\partial z}{\partial x} - 3y \frac{\partial z}{\partial y} = 0$ by method of separation of variables.

(8 × 5 = 40 marks)

- II. (A) State and prove the C.R. equations of polar co-ordinates for an analytic function.

(15 marks)

Or

- (B) (i) Find the transformation that maps the semi-infinite strip $-a < u < a, v \geq 0$ of the w -plane on to the upper half of the z -plane.

(8 marks)

Turn over

(ii) Find the Laurent's series about the point $z = 1$ for $f(z) = \frac{e^{2z}}{(z-1)^3}$.

III. (A) State and prove Cauchy Residue theorem. Also, evaluate $\int_C \frac{z-2}{z^2-z} dz$ where "C" is the circle $x^2 + y^2 = 4$.

Or

(B) State and prove Cauchy's integral formula. Also evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$ where C is the circle $|z| = 2$.

IV. (A) Show that $\int_{-1}^1 P_n^2(x) dx = \frac{2}{(2n+1)}, n = 0, 1, 2, \dots$

(15 marks)

Or

(B) Solve $y'' - xy' + y = 0$ using infinite series method.

(15 marks)

V. (A) Solve, by method of separation of variables, $4\frac{\partial z}{\partial x} + \frac{\partial y}{\partial y} = 3z$. Subject to $z = e^{-5y}$ when $x = 0$.

(15 marks)

Or

(B) A taut string of length $2l$ is fastened at both ends. The mid-point of the string is taken to a height "b" and then released from the rest in that position. Find the displacement of the string.

(15 marks)

[4 × 15 = 60 marks]