

- (b) Using Runge-Kutta method, find an approximate value of y when $x=0.2$, given that $\frac{dy}{dx} = x^2 + y^2$ with $y=0$ when $x=0$.
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5541/EC1

MAY 2011

MATHEMATICAL METHODS

(For those who joined in July 2006 and after)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

(5 × 20 = 100)

1. (a) (i) Find an analytic functions whose imaginary part is $3x^2y - y^3$. (8)

(ii) Evaluate $\int_c \frac{e^{2z}}{(z+1)^4} dz$, where c is $|z|=2$. (12)

Or

- (b) (i) Find the value of $\int_c \frac{e^z}{(z+1)^2} dz$ around the circle $|z-1|=3$. (6)

(ii) Evaluate $\int_0^{2\pi} \frac{d\theta}{5-4\sin\theta}$. (14)

2. (a) (i) Obtain the Fourier series to represent x^2 from $x = -l$ to $x = +l$. (14)

(ii) Find the complex form of Fourier series of $f(x) = e^{-x}$ in $(-1, 1)$.

Or

(b) (i) Find the Fourier transform of $f(x) = 1$ in $|x| < a$
 $= 0$ in $|x| > a$. (10)

(ii) Find the Fourier sine transform of e^{-x} , $x \geq 0$. (10)

3. (a) (i) Find $L(t e^{-t} \sin t)$. (10)

(ii) Find $L^{-1}\left[\frac{1}{s(s+1)(s+2)}\right]$. (10)

Or

(b) Solve the differential equation using Laplace transform $y'' + 2y' + 5y = e^{-t} \sin t$ given $y(0) = 3$, $y'(0) = 1$.

4. (a) (i) Use the iteration method to find the root of the equation $x = \frac{1}{2} + \sin x$.

(ii) Solve the following equations by Gauss Jordan method.

$$x + y = 2$$

$$2x + 3y = 5. \quad (10)$$

Or

(b) Solve the system of equations using Gauss-Seidel iteration method.

$$8x - y + z - 18 = 0$$

$$2x + 5y - 2z - 3 = 0$$

$$x + y - 3z + 6 = 0.$$

5. (a) (i) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by trapezoidal rule. (8)

(ii) Evaluate $\int_1^2 \frac{dx}{x}$ using Gauss-3 point formula. (12)

Or

Paper II — MEASUREMENT SYSTEM AND
TRANSDUCERS

(For those who joined in July 2006 and after)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

All questions carry equal marks.

(5 × 20 = 100)

1. (a) Explain in detail, the various categories of standards used in measurements. (12)
- (b) Write a brief note on Calibration. (8)

Or

- (c) Explain in detail, the functional elements of a measuring system with an example (20)
2. (a) Derive the generalized mathematical model of measurement system. (12)
 - (b) Explain briefly the zero order instrument. (8)

Or

