(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 $x=0$.

MATHEMATICAL METHODS

(For those who joined in July 2006 and after)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

$(5 \times 20 = 100)$

1. (a) (i) Find an analytic functions whose imagary 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 vale 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.

$x+y=2$

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

Or

(b) Solve the system of equations using huass-seidal 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 hauss-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

(c) Explain with suitable sketches, the response of a general form of instrument to a periodic input. (20)

3. (a) List out the basic requirements of transducer. (8)

(b) Explain the working principle and characteristics of platinum resistance thermometer. (12)

Or

(c) Explain the working principle of

(i) Humidity sensor. (10)

(ii) Hotwire anemometer. (10)

4. (a) Explain the working principle and characteristics of LVDT with necessary diagrams. (20)

Or

(b) Explain the methods of operation of variable capacitive transducer. (20)

5. (a) Explain the working principle and characteristics of piezo-electric transducer. (20)

Or

(b) Write notes on :

(i) MEMS. (10)

(ii) Nano sensors. (10)

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LINEAR IC'S AND APPLICATIONS

(For those who joined in July 2006 and after)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

(5 × 20 = 100)

1. (a) Explain the working of an instrumentation amplifier. (10)

   (b) With ideal characteristics explain the operation of an op-amp with its internal block diagrams. (10)

   Or

   (c) Explain the terms

   (i) Input Bias current

   (ii) Input offset current (5 + 5)

   (d) Explain the bridge circuit using RTD. (10)

2. (a) Explain the operation of an inverting comparator. (8)

   (b) Explain the circuit of linear and precision rectifiers in detail. (12)

   Or

(c) Explain the function of first order high pass filter with its frequency response. (15)

(d) Draw the positive clipper circuit and explain it. (5)

3. (a) Explain the operation of phase shift oscillator with its circuit. (10)

(b) Explain the function of sawtooth wave generator. (10)

Or

(c) Draw the internal Block diagram of frequency to voltage chip and explain its working. (15)

(d) Explain the operation of phase shift detector. (5)

4. (a) With internal block diagram of IC 555 explain its functioning as monostable mode. (15)

(b) Explain any application of 555 timer in astable mode. (5)

Or

(c) Discuss in detail the different types of phase detectors. (15)

(d) Explain the voltage controlled oscillator circuit. (5)

5. (a) Explain the operation of successive approximation type ADC. (12)

(b) Draw the dual (I 150) voltage power supply using IC regulators and explain. (8)

Or

(c) Explain

(i) Weighted renitor DAC. (10)

(ii) Counter type ADC. (10)

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