328411(14)

B. E. (Fourth Semester) Examination, Nov.-Dec., 2007

(AEI, EI, Et & T Engg. Branch)

MATHEMATICS-IV

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Each question carries equal marks. There is internal choice in each question.

Unit-I

1. (a) Find $J_0(x)$ and $J_1(x)$. 2

(b) Solve in series the equation : 10

Or

A rod of length l with insulated sides is initially at a uniform temperature u_0. Its ends are suddenly cooled to 0°C and are kept at that temperature. Find the temperature function $u(x, t)$.

(c) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ which satisfies the conditions

$u(0, y) = u(l, y) = u(x, 0) = 0$ and

$u(x, a) = \sin \frac{n\pi x}{l}$. 7

Or

A transmission line 1000 km long is initially under steady-state conditions with potential 1300 volts at the sending end ($x = 0$) and 1200 volts at the receiving end ($x = 1000$). The terminal end of the line is suddenly grounded, but the potential at the source is kept at 1300 volts. Assuming the inductance and leakance to be negligible, find the potential $E(x, t)$.

Unit-IV

4. (a) Write about Initial value theorem for Z-transform. 2

(b) Using Z-transform, solve the difference equation : 7

$u_{n+2} - 4u_{n+1} + 3u_n = 5^n$.

Or

Find the inverse Z-transform of :

$$\frac{2z}{z^3 - z^2 + z - 1}$$

(c) Find the inverse Z-transform of : 7

$$\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$$

Or

State and prove the Final Value theorem for z-transform.

Unit-V

5. (a) The daily consumption of electric power (in millions of kW-hours) is a random variable having the probability density function :

$$f(x) = \begin{cases} \frac{1}{4} x e^{-x/2}, & x > 0 \\ 0, & x \le 0 \end{cases}$$

If the total production is 12 million kW-hours, determine the probability that there is power cut (shortage) on any given day. 4

(b) A die is tossed thrice. A success is "getting 1 or 6" on a toss. Find the mean and the variance of the number of successes. 4

Or

Find the mean and variance of Binomial Distribution.

(c) Fit a Poisson distribution to the following data : 8

x_i	:	0	1	2	3	4
Observed frequencies f_i	:	30	62	46	10	2

Or

Show that the area under the normal curve is unity.