

**FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE
EXAMINATION, JUNE 2010**

EE 04 406—LINEAR SYSTEM ANALYSIS

(2004 Admissions)

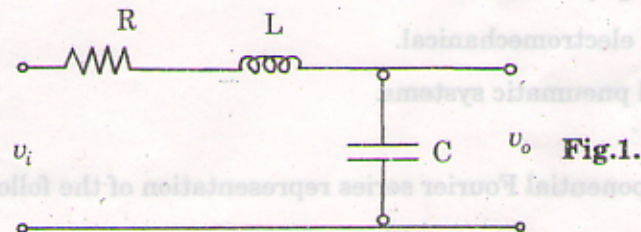
Time : Three Hours

Maximum : 100 Marks

Answer all questions.

Part A

- I. (a) Explain what is meant by linear and non-linear systems?
(b) Draw the block diagram of series RLC circuit shown in Fig. 1 below :



- (c) Explain the procedure for writing the models of mechanical system.
(d) Explain the resistance of hydraulic pneumatic systems.
(e) State and prove any one property of Fourier coefficient.
(f) Explain harmonics in three phase sources.
(g) State and prove convolution property of Laplace transform.
(h) Explain the relationship between Laplace transforms and Fourier transforms.

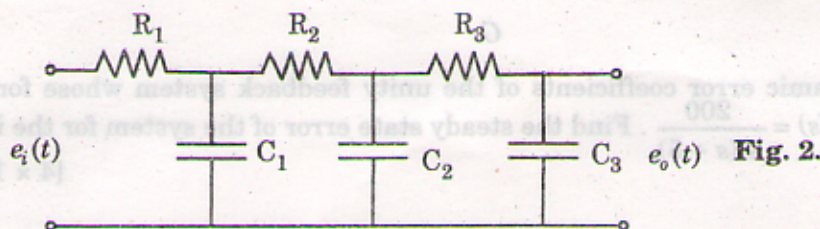
(8 × 5 = 40 marks)

Part B

- II. (a) List the properties of system and explain each property in detail.

Or

- (b) Draw the single flow graph and find out the transfer function of the circuit shown in Fig. 2 below :



Turn over

- III. (a) Derive the differential equations governing the following mechanical system and draw force-current analogy.

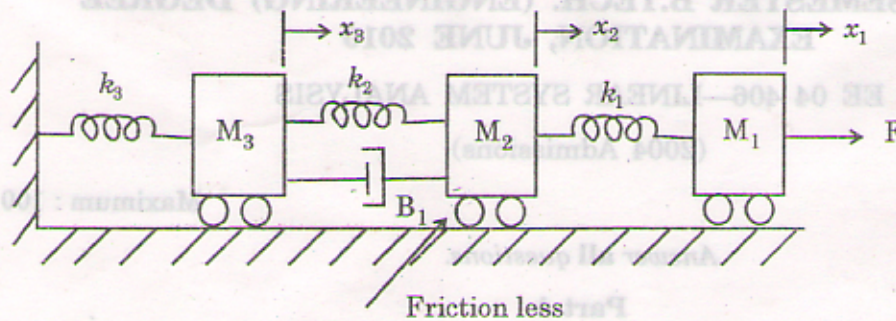


Fig. 3.

Or

- (b) Compare the following systems :—
- electrical and electromechanical.
 - hydraulic and pneumatic systems.

(8 + 7 = 15 marks)

- IV. (a) Find the complex exponential Fourier series representation of the following waveform.

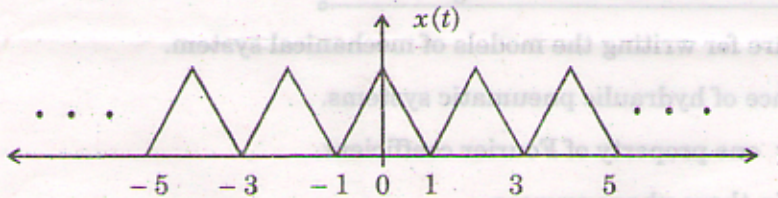


Fig.4.

Or

- (b) (i) State and prove Parseval's theorem for energy signal. (6 marks)
- (ii) Find the Fourier transform of the following signal and plot its magnitude spectrum :

$$x(t) = \begin{cases} -1, & -1 \leq t \leq 0 \\ 1, & 0 \leq t \leq 1 \end{cases}$$

(9 marks)

- V. (a) Using Laplace transform, derive the time response of second-order system for unit step input.

Or

- (b) Find the dynamic error coefficients of the unity feedback system whose forward transfer function is $G(s) = \frac{200}{s(s+5)}$. Find the steady state error of the system for the input $4t^2$.

[4 × 15 = 60 marks]