

**FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE
EXAMINATION, DECEMBER 2006**

EE 04 406—LINEAR SYSTEM ANALYSIS

(2004 admissions)

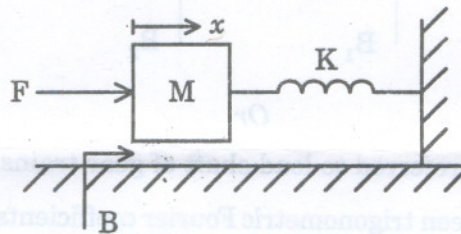
Time : Three Hours

Maximum ; 100 Marks

Answer all questions.

Part A

1. (a) Explain what is distributed and lumped systems.
- (b) State superposition principle and explain.
- (c) Derive differential equation for the following mass spring system under equilibrium condition when $M = 10 \text{ kg}$, $B = 30 \text{ N/m/sec}$. and $K = 20 \text{ N/m}$.



- (d) Compare hydraulic and pneumatic systems.
- (e) Define trigonometric Fourier series representation and explain.
- (f) Explain harmonic currents in star-connected non-linear loads.
- (g) List properties of Fourier transform.
- (h) Define impulse response and explain its significance.

(8 × 5 = 40 marks)

Part B

2. (a) (i) Check whether the following systems are LTI or not :—

$$(1) \frac{d^2 y(t)}{dt^2} + 2 \frac{dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt} + x(t).$$

$$(2) t \frac{dy(t)}{dt} + 2y(t) = tx(t).$$

(10 marks)

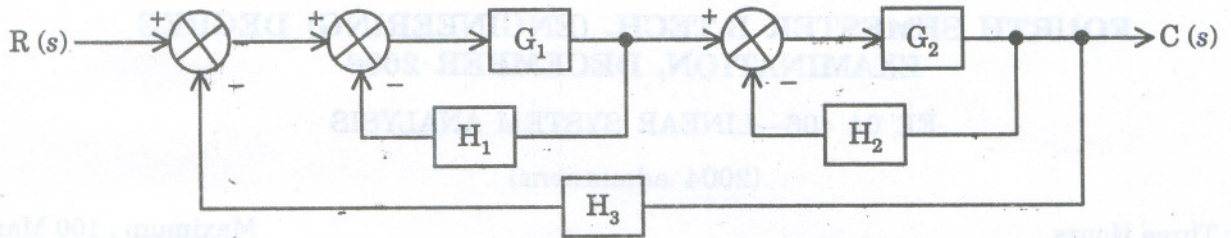
- (ii) Explain Kirchoff's law for RLC circuit.

(5 marks)

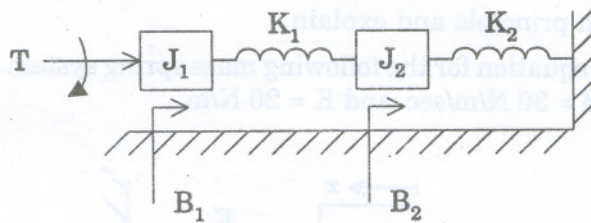
Or

Turn over

(b) Derive the transfer function using block reduction technique :-



3. (a) Write the differential equations governing the mechanical rotational system shown below. Draw the torque-voltage and torque-current electrical analogous circuits and verify by writing mesh and node equations :



Or

- (b) Derive torque equation referred to load shaft of gear trains.
4. (a) Derive the relation between trigonometric Fourier coefficients and complex exponential Fourier coefficients.
- Or
- (b) Derive steady-state solution of RC circuit for square wave periodic signal.
5. (a) State and prove any three properties of Fourier transform.
- Or
- (b) (i) State and prove Parseval's relation.
 (ii) Find the energy spectral density of the signal :

$$x(t) = e^{-|t|}$$

(4 × 15 = 60 marks)