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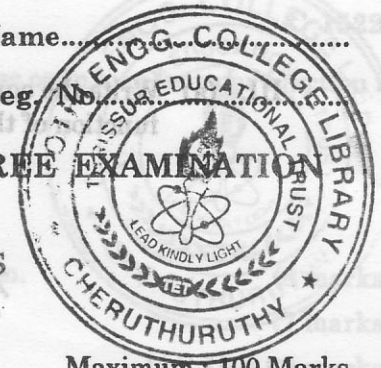
FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2010

EE 04 406—LINEAR SYSTEMS ANALYSIS

(2004 Admissions)

Time : Three Hours　　　　　　　　　　　　　　　　　Maximum : 100 Marks

Answer all questions.

Part A

I. (a) Explain what is meant by static and dynamic systems.

 (b) Write the Mason's gain formula and explain.

 (c) What is D'Alembert's principle ? Explain.

 (d) What is pneumatic system ? Explain.

 (e) Explain harmonics in three-phase sources.

 (f) What is meant by energy spectral density ? Explain.

 (g) Define dynamic error co-efficients and explain.

 (h) Explain what is meant by transient and steady-state response.

　　　　　　　　　　　　　　　　　　　　　　　　$(8 \times 5 = 40$ marks$)$

Part B

II. (a) (i) Explain modelling of electrical system using Kirchoff's Law.　　　(7 marks)

 (ii) Explain various block reduction rules.　　　　　　　　　　　　(8 marks)

Or

 (b) Convert the following block diagram into signal flow graph and find its transfer function using Masons's gain formula.
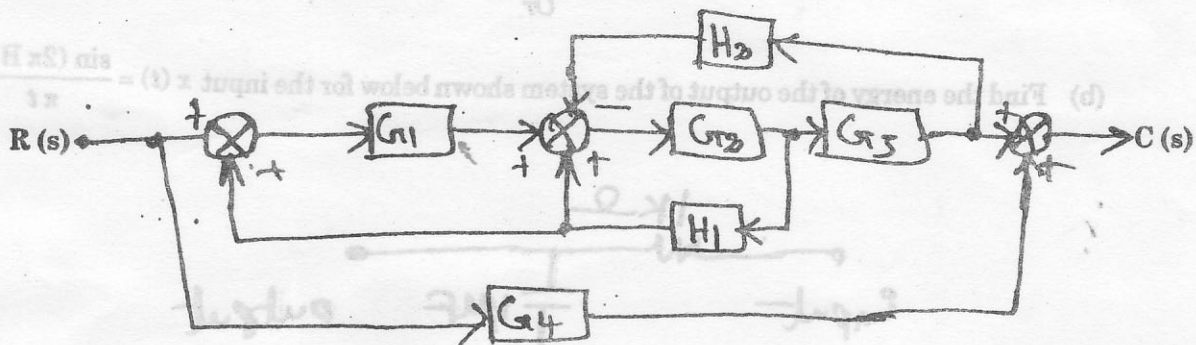

Fig. 1

III. (a) Write the equation of motion in s-domain for the system shown below. Determine the transfer function of the system :
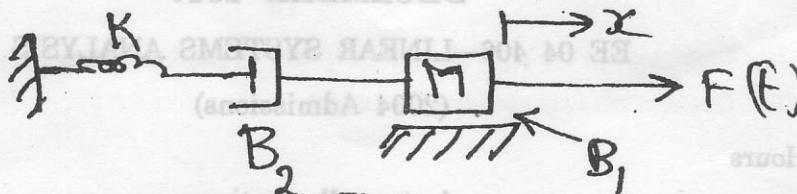

Fig. 2

Or

(b) Draw the torque-voltage and torque-current electrical analogus circuits for the rotational system shown below :
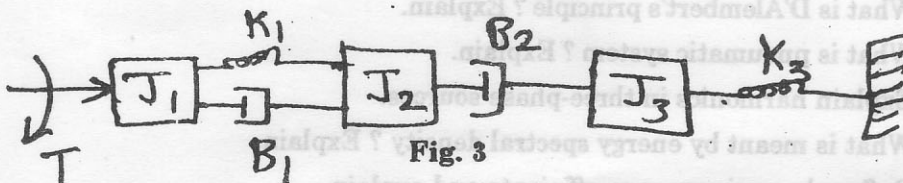

Fig. 3

IV. (a) A pure inductance, L = 10 mH, has the triangular current wave shown below, where $w = 500$ rad/sec. Obtain exponential Fourier series for the voltage across the inductance.
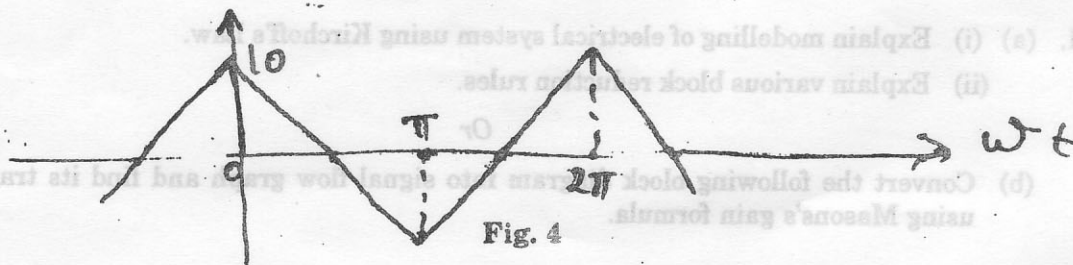

Fig. 4

Or

(b) Find the energy of the output of the system shown below for the input $x(t) = \dfrac{\sin(2\pi B t)}{\pi t}$, B > 0.
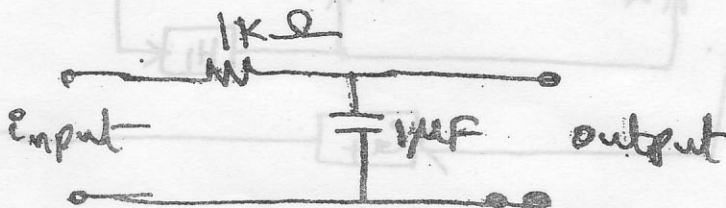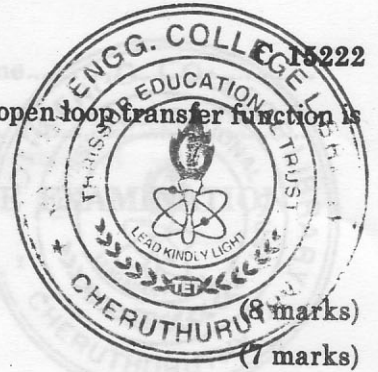

Fig. 5

V. (a) Obtain the unit step response of a unity feedback system whose open loop transfer function is

$$G(s) = \frac{4}{s(s+5)}.$$

Or

(b) (i) State and prove convolution property of Laplace transform. (8 marks)

(ii) Explain what is steady-state error. (7 marks)

[4 × 15 = 60 marks]