

This question paper contains 7 printed pages]

**HPAS (M)—2015**

**ELECTRICAL ENGINEERING**

**Paper II**

*Time : 3 Hours*

*Maximum Marks : 150*

*Note :— Attempt Five questions in all, taking at least one question from each Part. Question No. 1 is compulsory.*

**Part A**

1. (a) Obtain the state space representation of field controlled d.c. motor.
- (b) Draw the root locus of the unity feedback system whose open loop transfer function is :

$$G(s) = \frac{s}{(s^2 + 9)(s + 2)}$$

P.T./

- (c) Using block diagram reduction technique find the closed loop transfer function of a system whose block diagram is given in Fig. 1.

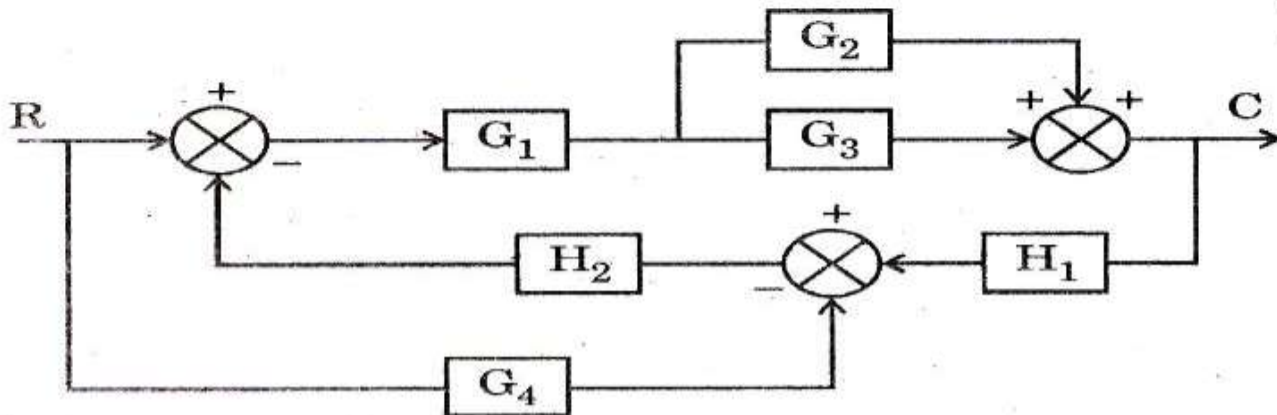


Fig. 1

2. (a) Explain the following machine cycles :
- Memory read cycle (3T)
  - IO write cycle (3T)
  - Bus idle cycle (2T or 3T).

- (b) How many interrupts are supported in 8085 microprocessor ? Write the priority of interrupt. Differentiate hardware and software interrupts.

### Part B

3. (a) A Maxwell's capacitance bridge shown in Fig. 2 is used to measure the unknown inductive impedance, the various values are :

$$C_1 = \underline{0.15} \mu\text{F} \text{ and } R_1 = 1500 \Omega$$

$$R_2 = 800 \Omega, R_3 = 1200 \Omega.$$

- (i) Determine the unknown impedance values

$$L_X \text{ and } R_X.$$

- (ii) Determine the Q-factor of the coil if excitation frequency is 2 kHz.

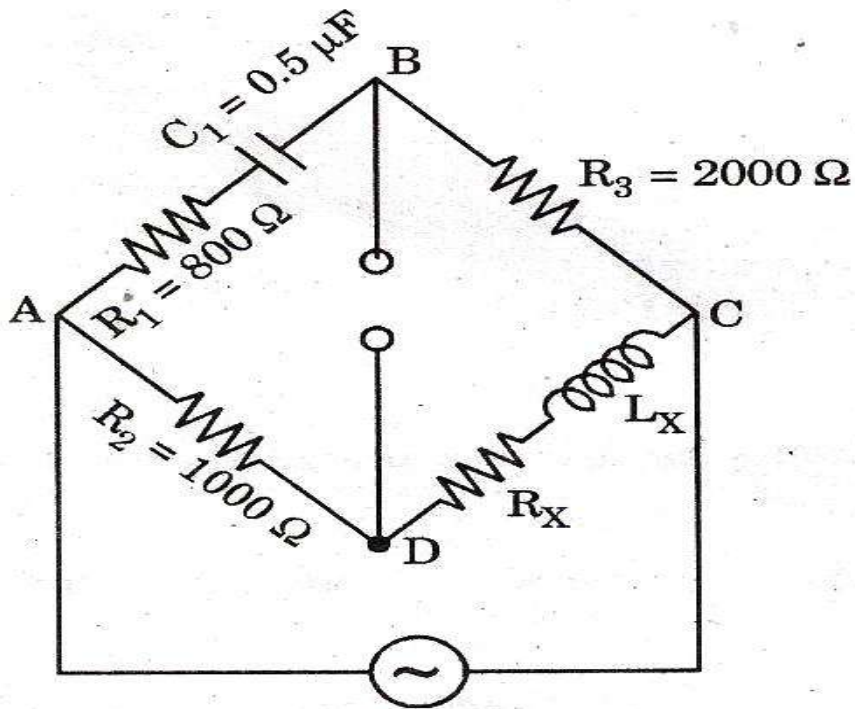


Fig. 2

- (b) Explain the working of piezoelectric transducer. Find the voltage sensitivity constant for a quartz crystal having charge sensitivity of 3 PC/N. Its dielectric constant of 4.5 and Young's modulus is  $9 \times 10^{12}$  Pa.

4. (a) Explain the CVD process for purification of silicon and state related chemical equations.
- (b) Explain the plasma etching mechanisms used for integrated circuit.

### Part C

5. (a) How do you describe the ratings of the circuit breaker ?
- (b) Explain the various states of power system and represent it with suitable block diagram.
- (c) What is XLPE ?
6. (a) Discuss in detail the various types of energy audit.

(b) How will reduction of speed in motor pump save energy ?

(c) Explain the working of any wave power device.

Also discuss its advantages and limitation.

### Part D

7. (a) Elaborate the following :

(i) Vertical redundancy check

(ii) Cyclic redundancy check.

(b) Explain and compare digital modulation techniques : BPSK and DBPSK.

(c) What is the need of channel coding ? What should be its objectives ?

(a) Write notes on :

(i) Super-conductivity

(ii) Polarization phenomena.

(b) With the help of band theory elaborate intrinsic and extrinsic semiconductor material.

(c) Explain working of :

(i) Optical fibres

(ii) Lasers.