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Candidate should write his/her Roll No. here.

Total No. of Questions : 7

No. of Printed Pages : 8

**SEM-2016(02)-II**  
**ELECTRICAL ENGINEERING**  
**Paper – II**

Time : 3 Hours ]

[ Total Marks : 300

***Instructions to the candidates :***

Please read the following instructions carefully before attempting questions.

- Candidates should attempt **FIVE** questions in all. Question No. 1 is compulsory. Out of remaining SIX questions, attempt any **FOUR**.
- **All** questions carry equal marks. The number of marks carried by a part of a question is indicated against it.
- Answer must be written in English only.
- Unless otherwise mentioned, symbols and notations have their usual standard meanings.
- Assume suitable data, if necessary and indicate the same clearly.
- Neat sketch should be drawn whenever required.
- All parts and sub-parts of a question are to be attempted together in the answer book.
- Any pages left blank in the answer book must be clearly struck out.

1. All parts carry equal marks.

10 × 6 = 60

- (a) What are the different ways of defining stability of a linear time invariant control systems ? Explain Routh Hurwitz criterion and its limitations. 6
- (b) Explain basic principles of speed control of DC shunt and series motors with the help of circuit diagram. 6
- (c) What do you mean by HVDC transmission ? Explain its working principle. 6
- (d) What is the need of circuit breakers ? What are the types of circuit breakers on the basis of medium employed ? 6
- (e) Design a 8-bit Arithmetic Logic Unit (ALU) and show subtraction operation. 6
- (f) What is the basic principle of Yagi antenna ? Show its elements with the help of diagram. What are its applications ? 6
- (g) Define Probability Density Function (PDF) of a random variable and explain its properties. 6
- (h) Explain the difference between Amplitude Modulation (AM) and Frequency Modulation (FM) based communication systems. Write mathematical expressions for both of them. 6

- (i) Explain the difference between time-division multiplexing and frequency division multiplexing. What is the major difference between Pulse Coded Modulation (PCM) and Differential Pulse Coded Modulation (DPCM) ? 6
- (j) What is the basic principle of Continuous Wave (CW) radar ? Explain its types and advantages. 6

2. (a) (i) Sketch the pin diagram and the architecture for microprocessor 8085 and discuss them. 10
- (ii) Sketch the status signals corresponding to OP code fetch and memory read machine cycles in 8085 microprocessors. 10
- (b) (i) Explain the synchronous and asynchronous modes of the data transfers with the help of flowcharts. 10
- (ii) Explain hardware and software polling schemes for microprocessor systems. 10
- (c) (i) Draw Static Random Access Memory (SRAM) and Dynamic Random Access Memory (DRAM) cells and explain them briefly. 10
- (ii) Sketch the pin and block diagrams of PPI 8255 and explain them in detail. 10

3. (a) Reduce the given block diagram in the below figure and find out its overall transfer function. 20

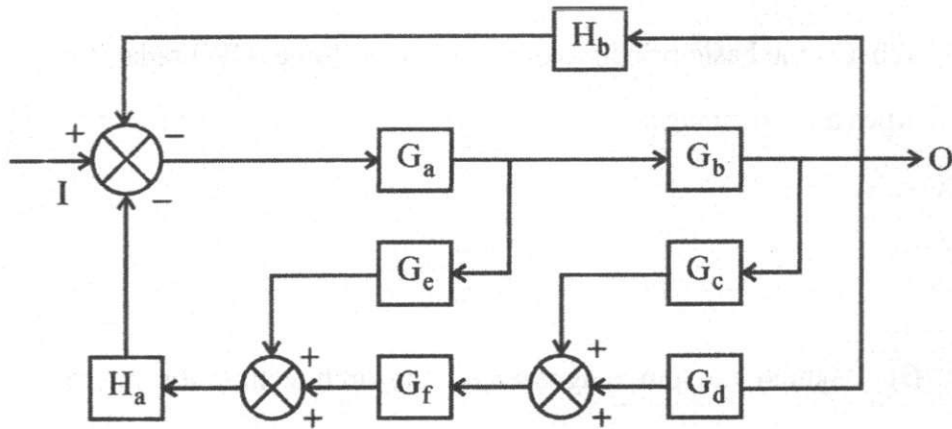


Figure : 3(a)

- (b) By employing Mason's gain formula, find out the overall transfer function  $O/I$  of the system shown in below figure 20

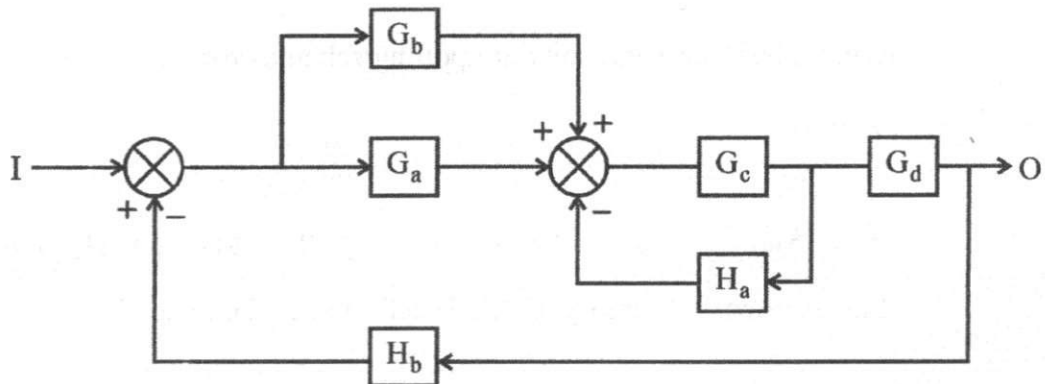


Figure : 3(b)

- (c) What do you mean by observability of a system ? Find out for the given systems whether they are observable or not.

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(i)  $\dot{X}_1$  and  $X_2$

$$\dot{X}_2 = -3X_1 - 2X_2 + U$$

$$\text{and } Y = X_1 + X_2$$

(ii)  $\dot{X}_1 = 2X_1 - X_2 + U$

$$\dot{X}_2 = 2X_2 + U$$

$$\text{and } Y = X_1 + X_2$$

4. (a) An amplitude modulated waveform is mathematically expressed as follows :

$$f_{AM}(t) = 20 \cos (2\pi 10^6 t) + 10 \cos (2\pi 10^6 t)$$

$$\cos (2\pi 10^3 t) + y \cos (2\pi 10^6 t)$$

$$\cos (4\pi 10^3 t) \text{ volts}$$

Determine the frequency components present in this signal and also determine their corresponding modulation indices. Sketch the spectrum and determine bandwidth.

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- (b) What is the difference between Wide Band Frequency Modulation (WBFM) and Narrow Band Frequency Modulation (NBFM) systems ?

Explain relationship between Phase Modulation (PM) and Frequency Modulation (FM) with the help of block diagrams.

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- (c) Why do we need pre-emphasis and de-emphasis methods in FM transmission system ? Sketch the circuits used for these methods and explain their working.

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5. (a) Explain working principle of a single phase transformer and find out the following for a single phase transformer which has a primary winding with 208 turns, 4180 volt and a secondary winding with 6 turns :

- (i) Secondary voltage at no load.
- (ii) Primary winding current with a 40 A load connected to secondary winding.
- (iii) Apparent power in primary and secondary circuits.

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- (b) A DC shunt motor has 4 poles, 4 parallel path, 882 armature conductors and rated as 20 hp, 220 V, 1200 rpm. The armature circuit resistance is 0.155 ohms. The rated armature current is 75 A and field current is 1.5 A. Calculate the following :

(i) The flux per pole ( $\phi$ /pole)

(ii) The electromagnetic torque ( $\tau$ )

(iii) The rotational losses

(iv) The efficiency ( $\eta$ )

(v) The shaft load

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- (c) What do you understand by trans position of conductors ? Determine inductance of three phase transmission lines with symmetrical and unsymmetrical spacing.

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6. (a) What type of protective device is used for the protection of an alternator against overheating of its stator and rotor. Discuss them in brief.

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- (b) What is Facts ? Describe briefly various devices used in the system.

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- (c) Describe the basic principle of working of single phase to single phase step-down cycloconverter for both continuous and discontinuous conduction for bridge type cycloconverter.

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7. (a) Explain the process of identification of Doppler direction in FMCW radar with the help of block diagram. Derive mathematical expression for measurement of range and Doppler in FMCW radar. 20
- (b) Explain working of the TV transmitter and receiver with the help of neat block diagram. 20
- (c) Write short notes on the following :
- (i) Index of refraction in fiber optic systems
  - (ii) Optoelectronic materials
  - (iii) Total internal reflections
  - (iv) Optical fiber losses
  - (v) Error control coding in digital communication. 20
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