

2007

ELECTRICAL ENGINEERING - II (Optional)

100043

*Standard : Degree**Total Marks : 200**Nature : Conventional**Duration : 3 Hours***Note :**

- (i) *Answers must be written in English.*
- (ii) *Question No. 1 is Compulsory. Of the remaining questions, attempt **any four** selecting one question from **each** section.*
- (iii) *Figures to the **RIGHT** indicate marks of the respective question.*
- (iv) *Use of log table, Non-Programmable calculator is permitted, but any other Table/Code/Reference book are not permitted.*
- (v) *Make suitable assumptions, wherever be necessary and state the same.*
- (vi) *Number of optional questions upto the prescribed number in the order in which they have been solved will only be assessed. Excess answers will not be assessed.*
- (vii) *Credit will be given for orderly, concise and effective writing.*
- (viii) *Candidate should not write roll number, any name (including their own), signature, address or any indication of their identity anywhere inside the answer book otherwise he/she will be penalised.*

1. Answer **any four** of the following (10 Marks each) :

40

- (a) Describe different Turn ON methods of thyristors.
- (b) Explain in details Pulse Code Modulation with block diagram. Show in the block diagram various noise signal added locations (noise due to quantizing and channel noise).
- (c) Define the term Discrete Time Fourier Transform (DTFT) and Inverse Discrete Time Fourier Transform. Explain when DTFT will exist.
State only following properties in connection with DTFT :
 - (i) Periodicity
 - (ii) Linearity
 - (iii) Time Shift

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- (d) Discuss various power quality issues related to wind energy systems. Also state parameters to consider when wind generators are connected to grid.
- (e) Calculate the annual energy savings and payback from replacing an existing standard motor with premium efficiency motor from following data :

Rating	Std Motor	Premium Efficiency Motor
	20HP 1800 rpm	20HP 18 rpm
	TEFC	TEFC
Operating hours	8000	8000
Efficiency	88.3%	93.5%
Power factor	0.85	0.89
Cost	Rs. 15000/-	Rs. 40000/-

Utility electricity Rate/Unit is Rs. 4 and demand charges Rs.200/KVA/month.

SECTION - A

2. Answer the following sub-questions :

- (a) (i) A single phase 230 V, 1kW heater is connected across 1 phase, 230V, 50Hz supply through an SCR. For firing angle delays of 45° and 90° calculate power absorbed in the heater element. 5
- (ii) Explain flag register of 8085. 5
- (b) A 220V, 1500rpm, 10A separately-excited dc motor has an armature resistance of 10 Ohm. It is fed from a single phase dc drive with an ac source voltage of 230V, 50Hz. Assuming continuous load current calculate : 15
- (i) Motor speed at the delay angle of 30° and torque of 5Nm.
- (ii) Developed torque at the delay angle of 45° and speed of 1000rpm.
- (c) Write a assembly level program for 8051 to arrange the given ten, 8 bit numbers in ascending order. 15

3. Answer the following sub-questions :

- (a) (i) Latching current for a SCR inserted in between a dc voltage source of 200V and the load is 100mA. Compute the minimum width of gate pulse current required to turn on this SCR in case the load consists of (a) $L=0.2H$, (b) $R=20\text{ Ohm}$ in series with $L=0.2H$. 5
- (ii) Generate a delay of 0.4 seconds by using register pairs of 8085. Take a crystal frequency 5 MHz. Enlist assembly level program. 5

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| (b) Explain with neat circuit diagram operation of four-quadrant chopper. | 15 |
| (c) Explain different addressing modes with examples for micro-controller 8051. | 15 |

SECTION - B

4. Answer the following sub-questions :
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| (a) (i) State the various aspects that deserve need of modulation of signal for information transmission. | 8 |
| (ii) Define the term modulation index of an AM signal and FM signal. | 7 |
| (b) Explain following multiplexing in connection with fiber optics systems. | 15 |
| (i) Time division multiplexing | |
| (ii) Frequency division multiplexing | |
| (iii) Wavelength division multiplexing | |
| (c) Draw the basic schematic block diagram of fiber-optic system components. What are the various materials used and requirements of optical fibers ?
What are advantages of fiber optics cable as a transmission medium ? | 10 |
5. Answer the following sub-questions :
- | | |
|---|-----------|
| (a) What is modulation ? State the major factors affecting modulation. Also state the various modulation technique used in practice.
What is 'narrow banding' in connection with modulation technique. | 15 |
| (b) What is Refractive index of a material ? On which factor it will depend.
With the neat diagram explain light refraction as it enters glass. | 15 |
| (c) (i) State five applications of fiber optic systems. | 5 |
| (ii) State some vital characteristics of fiber optical cable systems which can be measured indirectly. | 5 |

SECTION - C

6. Answer the following sub-questions :
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| (a) Discrete time system $y(n) = x(2n)$ is given. Check whether this system is : | 10 |
| (i) Static or dynamic | |
| (ii) Linear or non-linear | |
| (iii) Time shift varying or shift invariant | |
| (iv) Causal or non-causal | |

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| 9. Answer the following sub-questions : | |
| (a) Discuss various types of thermal energy collection system used in solar thermal applications.
Also discuss about energy scenario of India and future challenges. | 15 |
| (b) What is meant by power system stabilizers ? Why these are implemented in power systems ? Explain structure and tuning of power system stabilizers. | 15 |
| (c) State methods of improving transient stability of a system.
What is voltage stability and how it can be controlled ? | 10 |

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| (b) Obtain the convolution of two continuous time signals given below :
$h(t) = t \quad \text{for } 0 \leq t \leq 2$ $= 0 \quad \text{elsewhere}$ $x(t) = 1 \quad \text{for } 0 \leq t \leq 1$ $= 0 \quad \text{elsewhere}$ | 10 |
| (c) Consider a third order IIR transfer function is given by
$H(Z) = \frac{0.44Z^2 + 0.362Z + 0.02}{Z^3 + 0.4Z^2 + 0.18Z - 0.2}$ Obtain direct form II realization of the above transfer function. | 10 |
| (d) Draw and explain flow-chart/graph representation of the 15-point DFT computation by using the Cooley - Tukey algorithm. | 10 |
| 7. Answer the following sub-questions : | |
| (a) Impulse response of a linear time invariant system is
$h(n) = \{1, 2, 1, -1\}$ <div style="text-align: center; margin-left: 40px;"> \uparrow </div> Find out the response of the system to the input signal
$x(n) = \{1, 2, 3, 1\}$ <div style="text-align: center; margin-left: 40px;"> \uparrow </div> | 10 |
| (b) Determine whether the continuous time system $*y(t) = e^{x(t)}$ is
(i) static or dynamic
(ii) linear or non-linear
(iii) time variant or time invariant
(iv) causal or anticausal | 10 |
| (c) List the various FIR digital filter structures realization methods used in practice. Explain any one of the method of realization of FIR digital filter in detail. | 10 |
| (d) Draw and explain the procedure to complete flow-graph of the basic decimation-in-time FFT algorithm for $N=8$. | 10 |

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SECTION - D

8. Answer the following sub-questions :

- (a) Draw schematic of typical solar PV standalone system. Explain it in brief. 15

Differentiate Fixed Speed System with variable speed system.

- (b) A 50 Hz, 4 pole turbo generator rated 100 MVA, 11kV has an inertia constant of 8 MJ/MVA. Find (i) the energy stored in the rotor at synchronous speed (ii) If the mechanical input is suddenly raised to 80 MW for an electrical load of 50 MW. Find rotor acceleration, neglecting losses in the system. (iii) If the acceleration calculated in case(ii) is maintained for 15 cycles. Find the change in torque angle and rotor speed in rpm at the end of this period. 15

- (c) Fig. 8 (c) shows a single line diagram of a power system delivering 1pu power to the infinite bus, with the generator terminal voltage of $|v_t| = 1.0\text{pu}$. Calculate the generator emf behind transient reactances. Find the maximum power that can be transferred under the following conditions : 10

- (i) system healthy
(ii) one line shorted (3 phase) in the middle
(iii) one line open

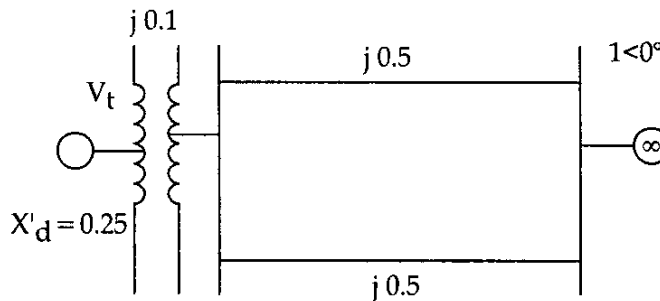


Figure 8 (c) Single line diagram