JXL

440041

2011
ELECTRICAL ENGINEERING (Optional)
Paper – II

Standard : Degree **Total Marks : 200**

Nature : Conventional (Essay) Type **Duration : 3 Hours**

N. B. :

1) *Answers must be written in* ***English.***
2) *Question* ***No. 1*** *is* ***compulsory****. Of the remaining questions, attempt* ***any four*** *selecting one question from* ***each Section.***
3) *Figures to the* ***RIGHT*** *indicate marks of the respective question.*
4) *Use of log table, Non-Programmable calculator is permitted, but any other Table/Code/Reference book are not permitted.*
5) *Make suitable assumptions, wherever be necessary and state the same.*
6) *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.*
7) *Credit will be given for orderly, concise and effective writing.*
8) *Candidates 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.*

SEAL

1. Answer **any four** of the following : **Marks**

(a) A full-wave rectifier circuit converts a 120V (rms) source into dc. The load of the circuit is a 10 ohm resistance. Calculate the following :

(a) Average voltage across the load

(b) Average voltage of the source

(c) rms voltage of the load

(d) rms current of the load

(e) Power consumed by the load. **10**

(b) Explain DPCM (Differential Pulse Code Modulation) with the help of block diagram. How it is different than PCM (Pulse Code Modulation). What are the advantages of DPCM over PCM. **10**

(c) Define Laplace transform of a signal x(t). State and prove the time shifting property of Laplace transform. **10**

(d) Explain various issues required to be considered at the time of interfacing wind generation with grid. **10**

P.T.O.

Marks

(e) The cost benefit for an energy saving project is as given first cost Rs. 1,00,000. The energy saved per annum is 6000 kwh and saving in demand charges Rs. 3,800/year. Due to modification is existing project annual maintenance cost saving will be Rs. 2,000/-

Calculate NPV for 5 years. Assume rate of electricity as Rs. 3/kwh, discounting rate 12% and no change in energy rate for 5 years. 10

SECTION – A

2. Answer the following sub-questions :

(a) (i) What are gate trigger source design requirements for SCR. 5

(ii) Write a assembly code in 8085 for transferring data from memory block B_1 to memory block B_2. 5

(b) With suitable waveforms describe operation of 3 phase inverter operating in 120° modes supplying resistive load only. 15

(c) Write an assembly program to generate a square wave of 10 KHz with timer '0' on port pin. by using 8051. The crystal frequency is 12 MHz. 15

3. (a) i) Enlist common turn on methods for thyristor. 5

(ii) Write a set of instructions to alter the contents of flag register in 8085. 5

(b) A two quadrant chopper operating in first and fourth quadrant is operated from a 220 V battery. The load is dc motor with resistance 0.1 ohm and inductance of 10 mH. The back emf magnitude is 100 V. Determine :

(i) Duty cycle for motoring mode

(ii) Critical duty cycle for regenerative braking

(iii) Duty cycle to achieve regenerative braking at the rated current of 10A

(iv) Power returned to source during braking

(v) The switching frequency of the devices if output frequency is 5KHz. 15

(c) What are the operating modes of serial port of 8051 ? Also give details of serial port control register. 15

SECTION – B

4. Answer the following sub-questions :

(a) Explain generation of PPM with the help of block diagram of wave forms. List its advantages and disadvantages. 15

(b) List advantages of fiber optic communication over other communication system. Also explain acceptance angle, numerical aperture and refractive index. 15

(c) Differentiate between LASER and LED. Explain spontaneous emission and stimulated emission. 10

Marks

5. Answer the following sub-questions :

(a) State the sampling theorem for low pass signals. Also explain different types of sampling. 15

(b) Explain time division multiplexing. List its advantages and disadvantages. 15

(c) Explain different types of fiber with the help of diagram. What are advantages of multimode fibers over single mode fiber. 10

SECTION – C

6. Short answer type questions. Answer the following sub-questions :

(a) Plot following discrete-time exponential signal as a exponential sequence if :

(i) $a > 1$

(ii) $0 < a < 1$.

$x(n) = a^n$. 10

(b) What is meant by discrete convolution ? What are properties of it ? 10

(c) What is an FIR system ? Compare an FIR system with an IIR system. 10

(d) The block diagram of a three stage decimator which is used to reduce the sampling rate from 3072 KHz to 48 KHz is given in following figure 1[Q. 6 (d)]. Assuming decimation factors of 8, 4 and 2.

(i) Indicate the sampling rate at the o/p of each stage

(ii) Write down the overall decimation factor

(iii) Write down all possible sets of integer decimation factor, assume two stages of decimation

(iv) Write down possible sets of integer decimation factors assuming three stages of decimation. 10

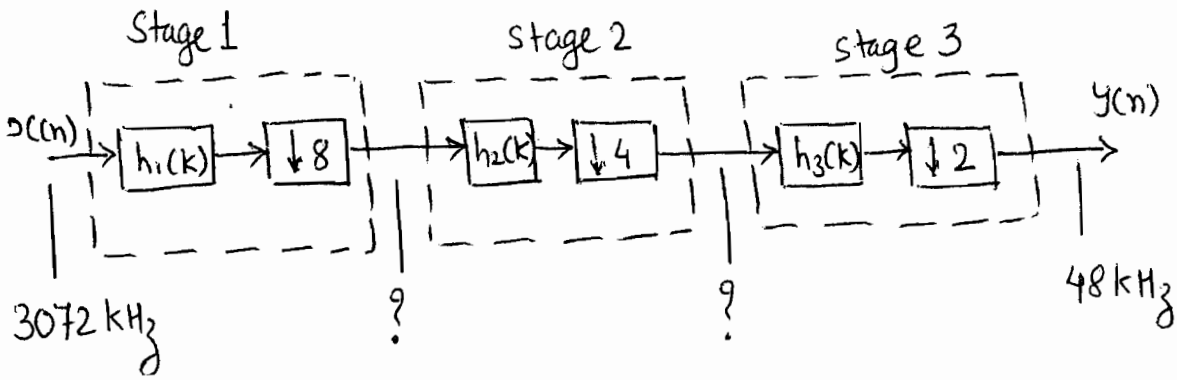

Figure 1 [Q. 6(d)]

Marks

7. (a) Find whether the following system is :

(i) Static/dynamic

(ii) Linear/non-linear

(iii) Time variant/time invariant.

$y(t) = A\,x(t) + B.$ **10**

(b) Determine stability of the system described by difference equation.

$y(n) = 0.6\,y\,(n-1) - 0.08\,y\,(n-2) + x\,(n).$ **10**

(c) What is window and why it is necessary ? What are the desirable characteristics of window ? **10**

(d) Find the order of a linear phase FIR filter using Kaiser window to satisfy the following amplitude response specification :

Stopband attenuation : 40 dB

Passband ripple : 0.01 dB

Transition width : 500 Hz

Sampling frequency : 10 KHz

Ideal cut off frequency : 1200 Hz. **10**

SECTION – D

(a) Explain the factors which determines energy generation from wind forms. **15**

(b) Explain role of power system stabilizer with help of suitable diagram. **15**

(c) Explain methods of enhancement of power system stability. **10**

9. (a) A 100 cm^2 solar cell is operating at 30°C with an output current of 1A, the load voltage is 0.4 V and the saturation current of the diode is 1nA. The series resistance of the cell is 10 m ohm and the parallel resistance is 1KΩ. At a given time, the solar power density is 200 W/m^2. Compute irradiance efficiency. Boltzmann's constant is 1.38×10^{-23} J/K and change constant 1.602×10^{-19}C. **15**

(b) Obtain current model of a synchronous generator. **15**

(c) A 20 MVA, 50Hz, 3-phase turbo alternator has 4-poles and inertia constant of 9MJ/MVA. If the disturbance causes the machine to accelerate for period of 15 cycles with acceleration power 3700 kW.

Estimate :

(1) Change in power angle (δ).

(2) Change in speed at the end of 15 cycles. **10**