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325201

May, 2019

M.Tech. (PS) - II SEMESTER

Digital Protection of Power System (MPS601)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Write two points on recent advances in digital protection. (1.5) CO1

(b) Write down the difference between MMM & MSS system in differential protective scheme. (1.5) CO2

(c) How does one decide the minimum sampling frequency in a numerical relay. (1.5) CO2

(d) Derive the signal to noise ratio due to quantization in DSP system. (1.5) CO2

(e) Draw the practical low pass anti aliasing filter characteristics. (1.5) CO3

(f) Write down the relationship between Fourier and Walsh technique. (1.5) CO2

(g) Explain dual slope converter. (1.5) CO2

(h) Draw diagram showing basis of digital to analog converter arrangement. (1.5) CO1

(i) Write two points on implementation of specific distance relay using differential equation algorithm. (1.5) CO3

(j) Derive the receiving end coefficient of reflection in travelling waves. (1.5) CO3

PART–B

2. (a) Explain forward interpolation algorithm used in digital protection. (7) CO3

(b) With proof, show pseudo Inverse technique amount to minimizing to LSE sense. (8) CO2

3. (a) Find the fourth element of the Walsh function having the order of 5 and length N = 8 i.e. Wal (5, 4). (7) CO2

(b) Describe with diagram the parallel comparator convertor for converting analog to digital signal. (8) CO2

4. Derive the Mann and Morrison algorithm in digital power system protection on undistorted single frequency sine wave. (15) CO3

5. (a) Explain Full cycle window Fourier algorithm. (7) CO3

(b) Find the maximum frequency that can be sampled without and with using hold circuit for DSP system having following specification:
Conversion time of ADC = 5 μs, number of bits in ADC = 16, aperture time of hold circuit = 250 ps. (8) CO2

6. (a) Write a note on digital differential protection of transformer. (7) CO1

(b) Explain to determine the error involved in numerically determined signal derivatives. (8) CO2

7. (a) Provide a frequency domain explanation of the aliasing phenomenon. (7) CO2

(b) Write a note on fundamentals of travelling wave based protection. (8) CO3