**MSCI02**

**MTEE16A2/MTETE16B2**

**MODEL QUE PAPERS**

**M.TECH**

**IV Semester**

**SPE: (CONTROL & INSTRUMENTATION ENGINEERING)**

**DIGITAL CONTROL AND STATE VARIABLE METHODS**

Time: 3 Hours Max. Marks: 75

***INSTRUCTIONS:***

* *Question paper is divided into three groups.*
* *Each group is of 25 marks.*
* *Figure to the right in bracket indicates mark.*
* *Assume suitable data if necessary.*

**GROUP A : Answer any three questions. (Question No. 1 is compulsory)**

Q.1 A unity feedback system has the forward path transfer function,



The reference input is a unit – step function, and the system is at rest initially. (i) Taking k as constant, determine the value of  which minimizes the integral square error. (05)

Q.2 Write a note on Analog PID controllers. (10)

Q.3 Explain the principle of the Tachogenerator with suitable diagram. (10)

Q.4 Explain the following Z-plane specifications of control system design. (10)

1. Stability (b) Disturbance rejection (c)Insensitivity and Robustness

Q.5 State the various steps for parameter optimization Explain Quadratic

Performance Index. Explain how the system error is being affected by

Adjusting the weighting factor. (10)

**GROUP B : Answer any three questions. (Question No. 6 is compulsory)**

Q.6 Explain Torque-Speed curves of a stepping motor. (05)

Q.7 Using Laplace transition method. Find the matrix exponential ef for,

(a)  (b)  (10)

Q.8 Draw and explain the unit-step response of a digital control system. (10)

Q.9 What are the terms for definiteness? (10)

Q.10 List different properties that describe the performance of a feedback control system and explain steady state accuracy in detail. (10)

**GROUP C: All Questions are Compulsory.**

**Q.11 Fill in the blanks (Each question carries 2 marks)**

(i) An important aspect of the feedback system design is the \_\_\_\_\_\_\_\_\_\_ of the control system.

(ii) The (input-output) feedback linearization is used for \_\_\_\_\_\_\_\_\_ system.

(iii) The transfer function based methods have been referred to as \_\_\_\_\_\_\_\_\_\_\_.

(iv) The (input-output) feedback linearization is used for \_\_\_\_\_\_\_\_\_ system.

(v) The law governing corrective action of the controller is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Q.12 Multiple choice question. (Each question carries 2 marks)**

(i) The routh criterion is used for \_\_\_\_\_\_\_\_\_\_\_.

(a) Linearity

(b) Stability

(c) Symmetry

(d) Transformation

(ii) Approximately \_\_\_\_\_\_\_\_\_\_ of feedback controls in the process industry are PI controllers.

(a) 5 %

(b) 50 %

(c) 75 %

(d) 100 %

(iii) Z = \_\_\_\_\_\_\_\_\_\_\_

(a) σ - jw (b) σ + j∞

(c) 0 - jw (d) σ + jw

(iv) The i/p and o/p of discrete time system are \_\_\_\_\_\_\_\_\_\_.

(a) u (k) and y (k)

(b) u (t) and y (t)

(c) u (t) and y (k)

(d) u (k) and y (t)

(v) The state variable model of the system is formed by \_\_\_\_\_\_\_\_\_.

(a) State equation

(b) Output equation

(c) Both

(d) None of these

**Q.13 True or false (Each question carries 1 marks)**

(i) The PLCs are basically computer based.

(ii) This actual signal input is defined as the reference output.

(iii) The computer programs are discrete time systems.

(iv) The PLCs are basically computer based.

1. The quantization error is directly proportional to the no. of bits/word.

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