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TEST-3

Ph.D. Research Scholar (ECE)

COURSE TITLE: ADVANCED CONTROL SYSTEMS MAX MARKS: 35

COURSE CODE: 10M1WEC132 MAX DURATION: 02 HRS

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Note: Attempt all questions. Carrying of mobile phone in examination hall is not permitted.

Q-1: (a) Explain in detail about the shared-network control systems and remote control system. [4]

(b) Give your comments about following challenges of NCS: [1.5+1.5+1=4]

(1) Stability in control and delay compensation,

(2) Bandwidth allocation and scheduling,

(3) Network security.

Q-2: (a) Give the block diagram of network productive control. Give the design algorithm of the networked predictive control scheme in case of network delay compensation. [4]

(b) Show that stability criterion of the closed-loop networked predictive control system with constant delay is that the system is stable if and only if the roots of the following polynomial are within the unit circle:

$$A(z^{-1})(1+S_0(z^{-1})z^{-1})+z^{-d-f-k}B(z^{-1})(Q_k(z^{-1})+Q_k(z^{-1})S_0(z^{-1})z^{-1}-Q_0(z^{-1})S_k(z^{-1})z^{-1})=0$$

[4]

Q-3: Describe a cyber-physical system (CPS) terms of :

(i) Challenges and opportunity

(ii) Stability, Performance and Safety in CPS

(iii) Sensing, Computing and Networking Systems

(iv) Modeling, Design and Development [6]

Q-4:Explain the following aspects of Internet of Things (IoT): [6]

(i) IoT Challenges

(ii) Convergence of IT(Information Technology) and OT (Operational Technology)

(iii) Simplified and Standardized IoT Architecture

Q-5: Write short notes on any <u>three</u>: [6]

(a) Controllability and observability

(b) State-feedback

(c) Riccati equation

(d) Packet drop w.r.t to NCS