4E2054

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B. Tech. IV Sem. (Back) Exam., June/July-2014

Mechanical Engineering

4ME6 Mechanical Measurements & Control

Common for Mech., Engg. & Automobile Engineering

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT – I

Q.1 (a) Derive an expression for the output from the full bridge arrangement of strain gauges. [8]

(b) What is use at dummy gauge? Explain how do they effect the output of a strain gauge bridge. [8]

OR

Q.1 (a) Explain active and passive instruments, giving example of each. Discuss the merits of active and passive elements. [8]

(b) Explain the method of calibration of strain gauges. [8]

UNIT – II

Q.2 (a) Describe the working principle, construction and method of using an optical pyrometer with the help of neat diagram. [8]

(b) Explain with neat sketches the working, construction, advantages and disadvantages of resistance thermometer. [8]

OR

Q.2 What is a thermocouple? Name any two types of thermocouples. Describe with the help of diagram the construction and working of a thermocouple type pyrometer. [16]

UNIT – III

Q.3 (a) Distinguish between open loop and closed loop control systems with the help of a suitable diagram. Illustrate your answer using block diagram schematics. [8]

(b) What does signal flow graph represent? Define the various terms associated with it. List and graphically represent the different rules to simplify a given signal flow graph. [8]

OR

(a) Describe in detail analog and digital data acquisition system. [8]

(b) Explain the type of software used for data analysis. [8]

UNIT – IV

Q.4 (a) Derive the transient response of a unit input first order system. [8]

(b) Specify the time response specifications with the help of a diagram. [8]

OR

Q.4 (a) The forward loop of a unity fees back control system is given by -

$$G(S) = \frac{K}{S(S+6)}$$

Determine the value of K above which the system exhibits oscillatory behavior and obtains the output for K=8 and K=13 for a unit step input. [8]

(b) Discuss the operation of a position control serve mechanism employing dc motor and obtain its transfer function. [8]

UNIT – V

Q.5 (a) The characteristic equation for a certain feedback control system at input $S^4+43^J+133^2+36S+K=0$. Determine the range of value of K for the system to be stable. [8]

(b) Explain absolute and relative stability of a system. Discuss Routh and Hurritz criterion for stability. [8]

OR

Q.5 (a) Sketch the wat locus

$$G(s)\,H(r) = \frac{K}{S(S+1+j)(S+1-j)}$$ [8]

(b) Explain the effect of addition of open loop poler and zeros in root locus and stability. [8]
