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B.Tech III Year II Semester (R09) Supplementary Examinations May/June 2017 INSTRUMENTATION & BIOPROCESS CONTROL

(Biotechnology)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions All questions carry equal marks

- 1 (a) Discuss the principle of working of thermocouple
 - (b) How is pH measured using a calomel electrode?
- 2 (a) Discuss the working of psychometric method for measurement of humidity.
 - (b) Describe any one method for analyzing the composition of a gas.
- 3 Derive the equations for time response of a first order system when subjected to:
 - (a) Unit step input.
 - (b) Unit ramp input. Draw the response curves in each case and make your own comments on them.
- 4 (a) Establish the time response for unit step change in input for a first order process described by the transfer function $G(S) = \frac{1}{(1 + \tau_n S)}$.
 - (b) Giving example, explain the terms proportions gain, proportional band and the relation between them.
- 5 (a) Derive the transfer function for a chemical reactor.
 - (b) Discuss about PI and PD controllers in detail.
- 6 (a) Control the liquid level in a tank against inflow disturbances by manipulating the outlet flow. Use a proportional controller. Derive the equation to describe closed-loop response. Present the special case of a step disturbance.
 - (b) Determine the stability by Routh criterion for the system with following characteristic equation: $S^4 + 3S^3 + 5S^2 + S^4 + 4S + 2 = 0$
- 7 (a) Sketch the Bode plot for Pl control.
 - (b) Derive the response of general First order system to Sinusoidal input, define amplitude and phase lag.
- 8 (a) With representative illustration, distinguish between cascade control and feed forward control.
 - (b) Write short notes on controller tuning
