

B. E. ELECTRONICS AND TELE-COMMUNICATION ENGINEERING

FOURTH YEAR, SECOND SEMESTER EXAMINATION - 2019

ELECTIVE: INDUSTRIAL ELECTRONICS

Time : 3 Hours

Full Marks :100

Assume all rectifiers are AC-Mains operated

- 1(A) a. Define Rectification efficiency ($\eta\%$) of Half-Wave (HW)-rectifier
 b. Determine ($\eta\%$) of a HW-rectifier if diode resistance is $r = 100 \Omega$ & load = 200Ω
 c. Derive the relation used 5+5+10
- OR**
- (B) a. What is multi (m)-phase rectifier ?
 b. Determine values of I_{dc} , E_{dc} and $\eta\%$ for m-phase rectifier; assume $R=1K \Omega$
 c. Define transformer utilization factor (TUF) for m-phase rectifier. 4+12+4
- 2(A) a. Explain characteristics of SCR; how it is used for controlled rectification
 b. Describe the method of UJT firing angle control
 c. A RC-relaxation oscillator using UJT ($\eta=0.5$) is used for triggering a SCR; Determine the period (T) of trigger if $R=1K \Omega$ & $C=1\mu F$. 6+4+10
- OR**
- (B) a. What is Push-Pull power inverter (PPPI) ?
 b. Determine peak output voltage if $V_{cc} = 6V$, secondary $N_s = 7$ and total $N_p = 20$ 8+12
- 3(A) a. What are the standard test signals for a Servo system
 b. Transfer function $H(s)$ of a servo system is
 $H = 10K / [s^2 + 40s + 10K]$; $K \equiv$ forward path gain
 Evaluate the relative stability of the system for (i) $K=100$ (ii) $K=50$ 5 + 15
- OR**
- (B) a. Define the time-constant of an Industrial liquid level system
 b. Such a system has out-flow $q_o = 10m^3/s$ from a storage-tank of Area = $2m^2$; outflow differential head = $5m$.
 (i) Show a sketch of outflow $q_o(t)$ for unit step change in inflow $q_i(t)$
 (ii) Calculate $q_o(t)$ | $t = 1$ m.sec. 5 + 15
- 4(A) a. What is the concept of Resistance Welding (RW) ?
 b. For a RW, average current rating = $3A$; rectified half-sine wave is passed for 1 sec and then remains idle for 11 sec. What is the maximum safe current 10+10
- OR**
- (B) a. Explain the principles of Induction heating (IH)
 b. What is Curie temperature
 c. What is Steinmetz equation 10+5+5
5. Indicate True(T)/False(F) for following : 5x4
- a. DC current for a 6- Φ rectifier with $R=10K \Omega$ is $5A$
 b. Hysteresis power loss in IH is $P = fK B^3$
 c. Ratio (E_{dc}/E_m) for a single-SCR HW-rectifier is $2/\pi$
 d. Thermal power in dielectric heating is $P_T = 100$ (Mass x Temperature Rise)
 e. First maximum-value in transient response for a 2nd-order servo system occurs at $t = \pi / \{ \omega_n \sqrt{1 - \delta^2} \}$