

B. E. ELECTRONICS AND TELE-COMMUNICATION ENGINEERING
FOURTH YEAR SECOND SEMESTER EXAMINATION 2018

INDUSTRIAL ELECTRONICS

Time : 3 Hours

Full Marks : 100

ANSWER ALL THE FIVE QUESTIONS

(All parts of the same question must be answered at ONE Place only)

- 1 (A)** a) Define Ripple Factor (γ) for a FW rectifier. 5+5+10
 b) For such rectifier with shunt-C filter, desired $\gamma = 2.97\%$
 Determine $C(\mu F)$; given $R=1K\Omega$ (load) & conduction angle $=10^\circ$
 c) Derive the relation used
- OR**
- (B)** a) Explain the operation of a multiphase $m-\Phi$ rectifier - what are its advantages 5 +5 +10
 b) Define Efficiency(%) and P_{dc}
 c) Assume $R=1K\Omega$ (load) for a $4-\Phi$ rectifier; determine P_{dc} and \bar{E}_{dc}
- 2 (A)** a) Explain the characteristics of (i) SCR and (ii) TRIAC 5+5+10
 b) A SCR rectifies the AC mains-line voltage to obtain $I_{dc} = 27 \text{ mA}$ @ $R_L = 3K\Omega$; Find firing angle
- OR**
- (B)** a) Explain the principles of Push pull power inverter (PPPI) with a neat transistorized-circuit
 b) For the PPPI, calculate (i) Total number of P-turns (ii) Peak Output voltage 10+5+5
 Given $A = 1 \text{ sq. inch}$, $B = 10 \text{ K.Gauss}$, $f = 3\text{KHz}$, $N_s = 60$, $V_{cc} = 18. \text{V. dc}$
- 3 (A)** a) A d.c. motor-armature controlled industrial Servo system has transfer $F(s) = 5K / \{s^2 + 36s + K\}$ 10+10
 For $K_1 = 200$ and $K_2 = 500$; Calculate and Tabulate values of
 (i) Damping Factor (δ) (ii) Natural frequency - ω_n (rad/s)
 Comment on relative stability assuming unit step-input.
- OR**
- (B)** a) Show a simple block diagram of armature-controlled servo-system 8+6+6
 b) The following sets of data are given for such system
 (i) $\delta = 0.5$ $\omega_n = 29.6$
 (ii) $\delta = 0.1$ $\omega_n = 85.2$
 Determine Settling time T_s (5% criterion) for the above cases and sketch the pole-locations on the complex s -plane.
- 4 (A)** a) Explain the principle of Resistance Welding with a typical inverse-parallel SCR-control circuit. 10+10
 b) The rectifier has a Peak-current rating of $52A$, an average current rating of $4.2A$ and maximum averaging time of 16 sec ; device passes rectified half-sine wave for 6 sec to produce a Weld.
 What is the Maximum safe current (I_m).
- OR**
- (B)** a) Explain the principle of Induction heating with Steinmetz equation 10+6+4
 b) Write an equation for the estimate of power (Δp) dissipated as heat on the work-load
 c) What is Curie Temperature.
- 5.** a) What is Programmable Logic Controller (PLC). Show a basic PLC structure 10+10
 b) Design a logic-control circuit using four Relays (A,B,C,D) which receive BCD numbers and provide output signal when the present number is 2 or multiples of 2