

ee24btech11015 - Dhawal

- 27) The function  $f(x) = 2x - x^3 + 3$  has
- a maxima at  $x = 1$  and a minima at  $x = 5$
  - a maxima at  $x = 1$  and a minima at  $x = -5$
  - only a maxima at  $x = 1$
  - only a minima at  $x = 1$
- 28) A lossy capacitor  $C_x$ , rated for operation at 5 kV, 50 Hz is represented by an equivalent circuit with an ideal capacitor  $C_P$  in parallel with a resistor  $R_P$ . The value of  $C_P$  is found to be  $0.102 \mu\text{F}$  and the value of  $R_P = 1.25 \text{ M}\Omega$ . Then the power loss and  $\tan \delta$  of the lossy capacitor operating at the rated voltage, respectively, are
- 10 W and 0.0002
  - 10 W and 0.0025
  - 20 W and 0.025
  - 20 W and 0.04

- 29) Let the Laplace transform of a function  $f(t)$  which exists for  $t > 0$  be  $F_1(s)$  and the Laplace transform of its delayed version  $f(t - \tau)$  be  $F_2(s)$ . Let  $F_1^*(s)$  be the complex conjugate of  $F_1(s)$  with the Laplace variable set as  $s = \sigma + j\omega$ . If

$$G(s) = \frac{F_2(s) F_1^*(s)}{|F_1(s)|^2},$$

then the inverse Laplace transform of  $G(s)$  is

- an ideal impulse  $\delta(t)$
  - an ideal step function  $u(t)$
  - an ideal delayed impulse  $\delta(t - \tau)$
  - n ideal delayed step function  $u(t - \tau)$
- 30) A zero mean random signal is uniformly distributed between limits  $-a$  and  $+a$  and its mean square value is equal to its variance. Then the r.m.s value of the signal is
- $\frac{a}{\sqrt{3}}$
  - $\frac{a}{\sqrt{2}}$
  - $a\sqrt{2}$
  - $a\sqrt{3}$
- 31) A 220 V, DC shunt motor is operating at a speed of 1440 rpm. The armature resistance is  $1.0 \Omega$  and armature current is 10 A. If the excitation of the machine is reduced by 10 %, the extra resistance to be put in the armature circuit to maintain the same speed and torque will be
- 1.79  $\Omega$
  - 2.1  $\Omega$
  - 3.1  $\Omega$
  - 18.9  $\Omega$

- 32) A load center of 120 MW derives power from two power stations connected by 220 kV transmission lines of 25 km and 75 km as shown in the figure below. The three

generators G1, G2 and G3 are of 100 MW capacity each and have identical fuel cost characteristics. The minimum loss generation schedule for supplying the 120 MW load is



- |  |  |
|--|--|
| a) $P_1 = 80 \text{ MW} + \text{losses}$ | c) $P_1 = 40 \text{ MW}$                 |
| $P_2 = 20 \text{ MW}$                    | $P_2 = 40 \text{ MW}$                    |
| $P_3 = 20 \text{ MW}$                    | $P_3 = 40 \text{ MW} + \text{losses}$    |
| b) $P_1 = 60 \text{ MW}$                 | d) $P_1 = 30 \text{ MW} + \text{losses}$ |
| $P_2 = 30 \text{ MW} + \text{losses}$    | $P_2 = 45 \text{ MW}$                    |
| $P_3 = 30 \text{ MW}$                    | $P_3 = 45 \text{ MW}$                    |

33) The open loop transfer function  $G(s)$  of a unity feedback control system is given as,

$$G(s) = \frac{k \left( s + \frac{2}{3} \right)}{s^2 (s + 2)}$$

From the root locus, it can be inferred that when  $k$  tends to positive infinity,

- three roots with nearly equal real parts exist on the left half of the  $s$ -plane
  - one real root is found on the right half of the  $s$ -plane
  - the root loci cross the  $j\omega$  axis for a finite value of  $k; k \neq 0$
  - three real roots are found on the right half of the  $s$ -plane
- 34) A portion of the main program to call a subroutine SUB in an 8085 environment is given below.

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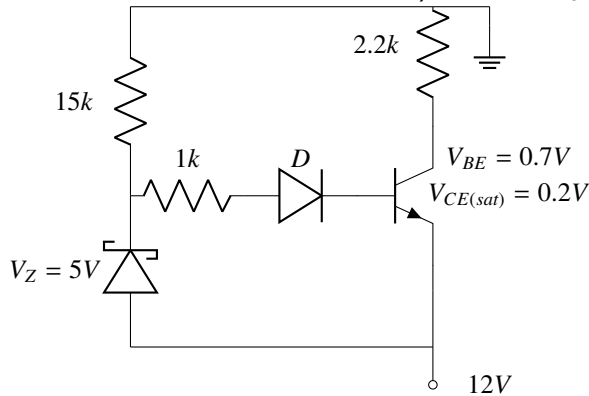
      .
      .
      .
LP:   LXI    D, DISP
      CALL  SUB
      .
      .

```

It is desired that control be returned to  $LP + \text{DISP} + 3$  when the RET instruction is executed in the subroutine. The set of instructions that precede the RET instruction in the subroutine are

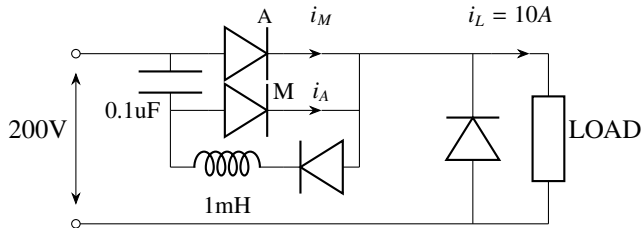
- |        |   |        |   |        |   |         |   |
|--------|---|--------|---|--------|---|---------|---|
| a) POP | D | b) POP | H | c) POP | H | d) XTHL |   |
| DAD    | H | DAD    | D | DAD    | D | INX     | D |
| PUSH   | D | INX    | H | PUSH   | H | INX     | D |
|        |   | INX    | H |        |   | INX     | D |
|        |   | INX    | H |        |   | XTHL    |   |
|        |   | PUSH   | H |        |   |         |   |

- 35) The transistor used in the circuit shown below has a  $\beta$  of 30 and  $I_{CBO}$  is negligible.



If the forward voltage drop of the diode is 0.7 V, then the current through the collector will be:

- a) 168 mA      b) 108 mA      c) 20.54 mA      d) 5.36 mA
- 36) A voltage commutated chopper circuit, operated at 500 Hz, is shown below.



If the maximum value of load current is 10 A, then the maximum current through the main (M) and auxiliary (A) thyristors will be:

- a)  $i_{M\max} = 12 A$  and  $i_{A\max} = 10 A$       c)  $i_{M\max} = 10 A$  and  $i_{A\max} = 12 A$   
b)  $i_{M\max} = 12 A$  and  $i_{A\max} = 2 A$       d)  $i_{M\max} = 10 A$  and  $i_{A\max} = 8 A$
- 37) The matrix  $[A] = \begin{pmatrix} 2 & 1 \\ 4 & -1 \end{pmatrix}$  is decomposed into a product of a lower triangular matrix  $[L]$  and an upper triangular matrix  $[U]$ . The properly decomposed  $[L]$  and  $[U]$  matrices respectively are

- a)  $\begin{pmatrix} 1 & 0 \\ 4 & -1 \end{pmatrix}$  and  $\begin{pmatrix} 1 & 1 \\ 0 & -2 \end{pmatrix}$       c)  $\begin{pmatrix} 1 & 0 \\ 4 & 1 \end{pmatrix}$  and  $\begin{pmatrix} 2 & 1 \\ 0 & -1 \end{pmatrix}$   
b)  $\begin{pmatrix} 2 & 0 \\ 4 & -1 \end{pmatrix}$  and  $\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$       d)  $\begin{pmatrix} 2 & 0 \\ 4 & -3 \end{pmatrix}$  and  $\begin{pmatrix} 1 & 0.5 \\ 0 & 1 \end{pmatrix}$

- 38) The two vectors  $\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$  and  $\begin{pmatrix} 1 \\ a \\ a^2 \end{pmatrix}$ , where  $a = \left(\frac{1}{2} + j\frac{\sqrt{3}}{2}\right)$ , are

- a) orthonormal      b) orthonormal      c) parallel      d) collinear

39) A three-phase 440V, 6 pole, 50Hz, squirrel cage induction motor is running at a slip of 5%. The speed of stator magnetic field with respect to rotor magnetic field and speed of rotor with respect to stator magnetic field are

- a) zero, -5 rpm      c) 1000 rpm, -5 rpm  
b) zero, 955 rpm      d) 1000 rpm, 955 rpm