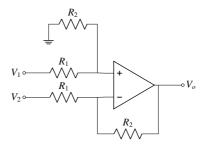
## ASSIGNMENT-2 GATE XE-2008

## EE24BTECH11019 - DWARAK A

## C: ELECTRICAL SCIENCES

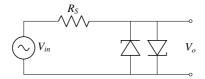
Q.9 to Q.30 carry two marks each.

- 1) In an induction motor the phase-difference,  $\phi$ , between the voltage applied at the stator terminals and the magnetizing current is
  - a)  $\phi = 0^{\circ}$
  - b)  $0^{\circ} < \phi < 90^{\circ}$
  - c)  $\phi = 90^{\circ}$
  - d)  $90^{\circ} < \phi < 180^{\circ}$
- 2) A voltage of +5V is applied (with respect to ground) to both the inputs  $V_1$  and  $V_2$  of an operational amplifier circuit shown in the figure.  $R_1 = 20k\Omega$  and  $R_2 = 10k\Omega$ . The output voltage,  $V_o$  is

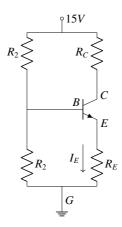


- a) -5V
- b) 0V
- c) 5V
- d) 20V
- 3) A pair of zener diodes each with a forward drop of 0.7V and a zener voltage of 4.7V is connected as shown in the figure. The input voltage is  $v_{in} = 10sin(2t)$ . The peak-to-peak output voltage,  $v_o$ , is
  - a) 5.4V
  - b) 4.7V
  - c) 1.4V
  - d) 0.7V

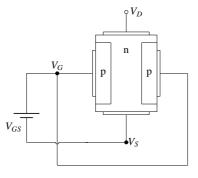
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4) The npn transistor shown in figure has  $h_{fe} = 99$  and  $V_{BE} = 0.7V$ . Under quiescent condition,  $V_{EG} = 4.3V$  and  $I_E = 1mA$ , and the current in  $R_2$  is 0.1mA. The value of  $R_1$ , required for biasing the circuit is

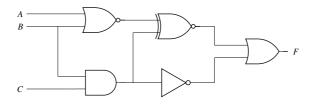


- a)  $10.1k\Omega$
- b)  $90.9k\Omega$
- c)  $100.1k\Omega$
- d)  $150.2k\Omega$
- 5) The forward characteristics of a p-n diode is given by  $i = I_s e^{\frac{n}{(nV_T)}}$  with n = 2 and  $V_T = 25mV$ . If the diode current is measured to be 100mA at 0.7V drop, the diode power dissipation at a diode current of 200mA is
  - a) 70mW
  - b) 140mW
  - c) 143mW
  - d) 147mW
- 6) For the n-channel JFET shown in the figure the pinch-off voltage,  $V_p = -5V$ , and gate source voltage,  $V_{GS} = -3V$ . The minimum required drain to source voltage,  $V_{DS}$  to operate at pinch-off condition is
  - a) 0V
  - b) 2*V*
  - c) 5V
  - d) 8V
- 7) The Boolean function corresponding to the truth table shown is



A	В	C	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

- a)  $F = A\overline{B}C + \overline{A}BC + \overline{A}BC + \overline{A}BC$
- b)  $F = ABC + AB\overline{C} + \overline{A}BC$
- c)  $F = ABC + AB\overline{C} + A\overline{BC} + \overline{A}B\overline{C}$
- d)  $F = A\overline{B}C + \overline{A}BC + \overline{A}BC + \overline{A}BC$
- 8) The decimal number 328 when converted to the base of 9 is equivalent to
  - a)  $(434)_9$
  - b)  $(424)_9$
  - c)  $(404)_9$
  - d) (304)<sub>9</sub>
- 9) The following logic circuit can be represented by the Boolean expression



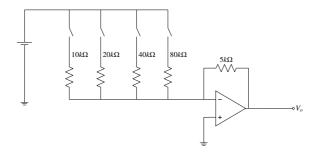
a) 
$$F = \overline{B} + BC + \overline{C}$$

b) 
$$F = \overline{B} + \overline{C}$$

c) 
$$F = (\overline{B+C})$$

b) 
$$F = \overline{B} + \overline{C}$$
  
c)  $F = (\overline{B} + \overline{C})$   
d)  $F = \overline{A} + \overline{B} + \overline{C}$ 

10) A 4-bit resistor network based D/A converter is shown in the figure. The output corresponding to the number 1010 is



- a) 5.0V
- b) 6.25V
- c) 7.25V
- d) 10.0V
- 11) Two 10V square waves of same frequency but 90° out-of-phase to each other are applied to X and Y deflecting plates of a CRO. Both channels are set at 5V/division and the CRO is operating in the X Y mode. The display on CRO will be
  - a) A bright circle
  - b) A bright ellipse
  - c) Two bright spots at the diagonal of a faint square
  - d) Four bright spots at the comers of a faint square
- 12) CRO that is used in X Y mode displays a line inclined at an angle of 135°. The X-channel gain is 5V/division and the Y-channel gain is 10V/division. If the display point at a given instant corresponds to +3 divisions on the X-axis, the input voltage to the Y-channel at that instant is
  - a) -30V
  - b) -15V
  - c) +15V
  - d) +30V

## Common Data Questions

Common Data for Questions 29 and 30:

A 1.0kW induction motor has 15 pole-pairs and is supplied from a 60Hz source. The motor runs at 0.05 slip. The stator loss is 80W.

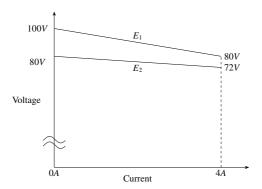
- 13) The speed of the rotating magnetic field in the motor and the frequency of the rotor induced voltage are
  - a) 120rpm, 1.5Hz
  - b) 120rpm, 28.5Hz
  - c) 240rpm, 3.0Hz
  - d) 240rpm, 57.0Hz
- 14) The rotor copper loss of this induction motor is

- a) 120rpm, 1.5Hz
- b) 120rpm, 28.5Hz
- c) 240rpm, 3.0Hz
- d) 240rpm, 57.0Hz

Linked Answer Questions: Q.31 to Q.34 carry two marks each.

Statement for Linked Answer Questions 31 and 32:

A practical dc voltage source is represented as an ideal dc voltage source in series with an internal resistance. The V-I characteristics of two such sources,  $E_1$  and  $E_2$ , are shown in the figure.



- 15) The respective internal resistances of  $E_1$  and  $E_2$  are
  - a)  $20\Omega$ ,  $8\Omega$
  - b)  $5\Omega, 2\Omega$
  - c)  $8\Omega$ ,  $20\Omega$
  - d)  $2\Omega$ ,  $5\Omega$
- 16) If the two sources,  $E_1$  and  $E_2$ , in question Q.31 are connected in parallel to feed a load of  $200\Omega$  resistance, then the load current is in the range
  - a) 0.0A to 0.5A
  - b) 0.5A to 2.0A
  - c) 2.0A to 4.0A
  - d) 4.0A to 8.0A

Statement for Linked Answer Questions 33 and 34:

A function F, in "Sum of Product (SOP)" form is described by

$$F = \sum m(0, 1, 3, 4, 5, 6, 7, 13, 15)$$

17) The Karnaugh Map for F is given by (X being don't care)

a)

AB CD	00	01	11	10
00	X	X	X	1
01	X	X	X	X
11	1	X	X	1
10	1	1	1	1

b)

AB CD	00	01	11	10
00	1	1	1	X
01	1	1	1	1
11	X	1	1	х
10	X	X	X	X

c)

AB CD	00	01	11	10
00	1	X	1	X
01	X	1	X	1
11	1	X	X	X
10	X	1	X	1

d)

AB CD	00	01	11	10
00	1	1	X	X
01	X	X	X	X
11	X	1	1	1
10	X	1	1	X

18) Using the Karnaugh Map obtained in question Q.33, the function, F reduces to

a) 
$$F = \overline{AC} + \overline{AD} + AB + BD$$

b) 
$$F = AC + AD + \overline{AB} + \overline{BD}$$

c) 
$$F = \underline{AC} + \overline{\underline{A}D} + \overline{\underline{AB}} + \overline{BD}$$
  
d)  $F = \overline{AC} + \overline{AD} + \overline{AB} + BD$ 

$$d) F = AC + AD + AB + BD$$