Reg No.:_____                    Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**
SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018
**Course Code: EC352**
**Course Name: COMPREHENSIVE EXAM (EC)**

Max. Marks: 50                                    Duration: 1 hour

## *Instructions:*

**Each question carries one mark. No negative marks for wrong answers**
**All questions are to be answered.**
**If more than one option is chosen, it will not be considered for valuation.**
**Calculators are not permitted**

1. Maxwell's divergence equation for the magnetic field is given by

   a) $\nabla \times B = 0$            b) $\nabla \cdot B = 0$       c) $\nabla \times B = \rho$       d) $\nabla \cdot B = \rho$

2. Which of the following statements is correct with regard to the directions of $E$ and $H$ in TEM mode of propagation

   a) Both $E$ and $H$ are entirely transverse to the direction of propagation.

   b) $E$ is entirely transverse to $H$ and $H$ has component in the direction of propagation.

   c) $E$ has a component in the direction of propagation.

   d) Both $E$ and $H$ has a component in the direction of propagation.

3. If VSWR is 3 , then magnitude of reflection coefficient will be

   a) 1/4         b) 1/3         c) 1/2         d) 1

4. An air filter rectangular waveguide has dimensions 6 x 4 cm, the cutoff frequency for $TE_{10}$ is

   a) 2.5 GHz           b) 25 GHz           c) 25 MHz           d) 5 GHz

5. Phase velocity Vpand group velocity $V_g$ in a waveguide (C is velocity of light) are related as

   a) $V_g V_p = C^2$         b) $V_g V_p = C$         c) $V_g / V_p = C$         d) $V_g V_p = \sqrt{C}$

6. The dominant mode in TE wave

   a) $TE_{11}$           b) $TE_{01}$           c) $TE_{10}$           d) $TE_{12}$

7. The depth of penetration of a wave in a loosy dielectric increase with increasing
   a) Conductivity       b) Wavelength        c) Permeability       d) Permittivity

8. For a dominant mode in a rectangular waveguide with breadth 10 cm, guide wavelength for a signal of 2.5 GHz will be

   a) 12 cm            b) 15 cm            c) 18 cm            d) 20 cm

9. The logic expression $Y = A + \bar{A} B$ is equivalent to

   a) $Y = AB$         b) $AB$         c) $A \bar{B}$         d) $A+B$

10. Minterms corresponding to decimal number 15 is

    a) $\bar{A}\bar{B}\bar{C}\bar{D}$     b) $ABCD$     c) $A+B+C+D$     d) $\bar{A} + \bar{B} + \bar{C} + \bar{D}$

11. A carry look ahead adder is frequently used for addition because it is

    a) Faster    b) more accurate      c) use fewer gates      d) costs less

12. The output $Q_n$ of a JK flipflop is zero. If it changes to 1 when a clock pulse is applied. Then the input $J_n$ and $K_n$ are respectively

    a) 0 and X         b) 1 and X      c) X and 0         d) X and 1

13. How many flipflops are required to build a binary counter circuit from 0 to 1023?

    a) 5            b) 6            c) 10            d) 12

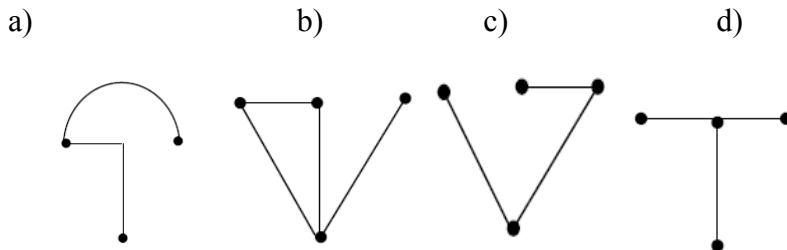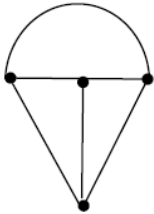14. For a circuit shown in figure below what is the frequency of the output Q
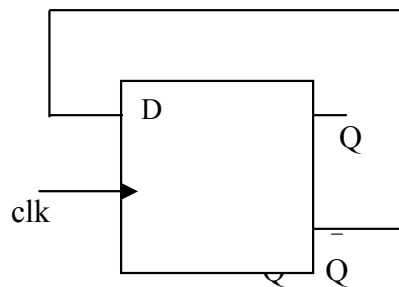


    a)  Twice the input clock frequency.      b) Half the input clock frequency.
    b)  Same as the input clock frequency.    d) None of these.

15. In a sequential circuit the output at any instant of time depends on
    a) Only on the inputs present at that instant of time
    b) On the past output as well as present inputs
    c) Only on past inputs
    d) Only on present outputs

16. A pulse train can be delayed by a finite number of periods using clocks in

    a) PISO              b) SIPO              c) PIPO              d) SISO

17. A 1000 KHz carrier is simultaneously modulated with 300 Hz and 200 Hz audio sine waves. The frequency which will not be present in output is

    a) 998 KHz         b) 999.7 KHz         c) 1000.3 KHz         d)700 KHz

18. If modulation index of AM wave is changed from 0 to 1, the transmitted power
    a) Increases by 50%         b) Increases by 75%
    c) Increases by 100%         d) Remains unaffected

19. In a superheterodyne receiver IF is 455KHz ,if it is tuned to 1200KHz,the image frequency will be
    a) 1655 KHz     b) 745 KHz     c) 2110 KHz     d) 910 KHz

20. In the generation of a modulated signal, a varactor diode can be used for
    a) FM generation only.         b) AM generation only.
    c) PM generation only.         d) Both (b) and (c).

21. Which of the following statements is NOT correct regarding the signal x(t) = 5 sin($2\pi$ x $10^3$t)sin($2\pi$ x $10^6$t) ?
    a) Upper sideband frequency is 1001000.
    b) Lower sideband frequency is 999000.
    c) x(t) is a DSB-SC signal.
    d) x(t) is an AM signal.

22. If an angle modulated signal is given by fa(t) = cos(2 x $10^8\pi$t + 75 sin 2 x $10^3$ $\pi$ t) then peak frequency deviation of the carrier is
    a) 1 KHz         b) 7.5 KHz         c) 75 KHz         d) 100 MHz

23. The fundamental period of the signal $e^{j\omega 0t}$   is

    a) $1/\omega o$         b) $2\pi\omega o$         c) $2\pi/\omega o$         d) $\omega o/2$

24. Energy of a signal A$\delta$[n] + A$\delta$[n-1] is

    a) $2A^2$         b) $A^2/2$         c) $A^2/4$         d) $A^2$

25. $\int_{-\infty}^{\infty} \sin(t)\delta(t)dt$     is equal to

    a) $\infty$         b) $\pi/2$         c) 0         d) 1/2

26. The Nyquist sampling rate of the continuous time signal Sinc(500t) is

    a) 1000 Hz.         b) 100 Hz.         c) 500 Hz         d) 250 Hz

27. If x(t) has the Fourier transform X(f), the Fourier transform of x(-t) is

    a) X(f)         b) |X(f)|         c) -X(f)         d) X(-f)

28. If x(t) is a real signal, then
    a) Magnitude response and phase response are even.
    b)Magnitude response and phase response are odd.
    c)Magnitude response is even and phase response is odd.
    d)Magnitude response is odd and phase response is even.

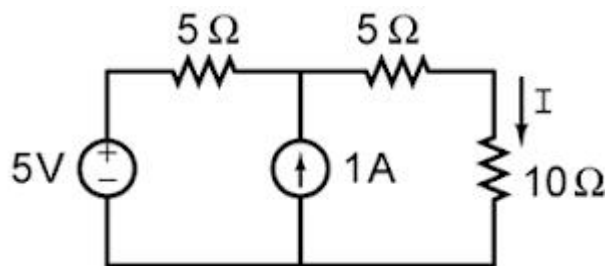29. Consider the network graph shown in the figure below .Which one of the following is 'NOT' a tree of the group?



a)                     b)                 c)                 d)



30. For the circuit shown, determine $V_1$ if $i_2 = 5 \sin(45t)$ and $i_1 = 0$



$M = 2H$
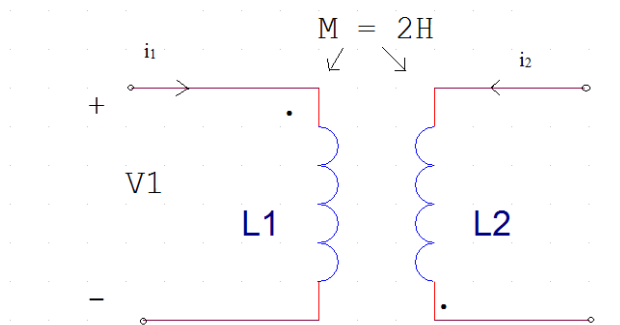
    a) 450 cos(45t)v       b) 450 sin(45t)v       c) -450 cos(45t)v       d) 45 sin(45t)v

31. Find the current I (in amperes) in the following circuit



    a)  0.75A              b) 0.5A                c) 1A                  d) 1.5A

32. The average power delivered to an impedance $(4 – j3)\Omega$ by a current $5 \cos (100\pi t + 100)$ A is

    a) 44.2 W  b) 50 W  c) 62.5 W  d) 125 W

33. A two port device is defined by the following pair of equations $i_1 = 2 v_1 + v_2$ and $i_2 = 2 v_1 + v_2$, its admittance parameters are $(y_{11}, y_{12}, y_{21}, y_{22})$ are given by

    a) [2,1,2,1]  b) [1,2,2,1]  c) [2,1,1,1]  d) [1,2,1,2]

34. For the two port network shown in the figure ,the impedance (Z )matrix (in $\Omega$) is
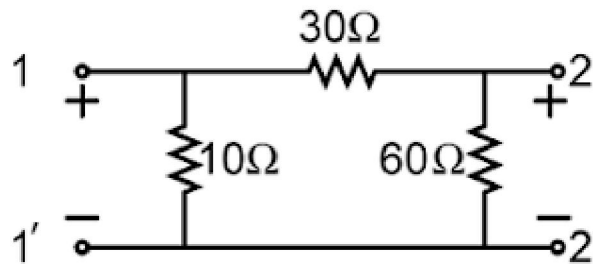


    a) $\begin{bmatrix} 6 & 24 \\ 42 & 9 \end{bmatrix}$  b) $\begin{bmatrix} 9 & 8 \\ 8 & 24 \end{bmatrix}$  c) $\begin{bmatrix} 9 & 6 \\ 6 & 24 \end{bmatrix}$  d) $\begin{bmatrix} 42 & 6 \\ 6 & 60 \end{bmatrix}$

35. An integrator circuit is

    a) Low pass filter  b) high pass filter  c) band pass filter  d) all pass filter
36. If a transistor is in saturation

    a)$I_C = \beta I_B$  b) $I_C > \beta I_B$  c) $I_C < \beta I_B$  d) $I_C = I_B$

37. Zener breakdown diodes have breakdown voltage which has
    a) Has positive temperature coefficient.  b) Has negative temperature coefficient.
    c) Is independent of temperature  d) None of the above.

38. The type of negative feedback in a RC coupled amplifier without bypass capacitor is
    a) Voltage series feedback.  b) Current series feedback.
    c) Voltage shunt feedback.  d) Current shunt feedback.

39. The phase shift produced by feedback network in a Weinbridge oscillator is

    a)180°  b) 0°  c) 90°  d) 270°

40. The dissipation at the collector is zero in the quiescent state and increases with excitation in the case of a

    a) Class A series fed amplifier  b) Class A transistor coupled amplifier
    c) Class AB amplifier  d) Class B amplifier

41. The total derivative of the function 'xy' is
    a) *xdy+ ydx*  b) *xdx+ ydy*  c) *dx+ dy*  d) *dxdy*

42. For the differential equation $\frac{dy}{dt} + 5y=0$ with $y(0) =1$ the general solution is

    a) $e^{5t}$      b) $e^{-5t}$      c) $5e^{-5t}$      d) none of these

43. The radial component of velocity for a particle moving in a circular path is

    a) zero      b) radius itself      c) variable      d) none of the above

44. In which Quadrant the HP comes above XY line and VP comes below XY line for orthographic projection?

    a)First Quadrant      b)Second Quadrant      c)Third Quadrant      d)Fourth Quadrant

45. The force applied on a body of mass 100 kg to produce an acceleration of 5 m/S$^2$ is

    a) 20 N      b) 100 N      c) 500 N      d) None of these

46. Which was the major green building rating system developed by TERI

    a) GRIHA      b) LEED      c) BREEAM      d) CASBEE

47. Which stage is directly responsible for the technical functioning of the product

    a) engineering function      b) research function      c) manufacturing function
    d) commercial function

48. The first full-scale and usually fully functional forms of a new design is called

    a) Model      b) prototype      c) rapid prototype      d) design attribute

49. The Air Pollution and Control Act, popularly known as the 'Air Act' was passed for the first time in US in

    a) 1955      b) 1999      c) 2004      d) 2015

50. Probability of a product successfully operation for a specific period of time is called

    a) reliability    b) durability      c) conformance      d) serviceability

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