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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R,S) / S6 (PT) / (WP) Examination April 2025 (2019 Scheme)

Course Code: ECT 308

Course name: COMPREHENSIVE COURSE WORK

Max. Marks: 50 Duration: 1Hour

Instructions: ***(1) Each question carries one mark. No negative marks for wrong answers***
(2) Total number of questions: 50
(3) All questions are to be answered. Each question will be followed by 4 possible answers of which only ONE is correct.
(4) If more than one option is chosen, it will not be considered for valuation.

1. The positive envelope of a single-tone amplitude modulated wave has a maximum value of 3 V and a minimum of 1V. The modulation index is …..

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

2. The fundamental period of a discrete-time signal x[n] = cos(7 n/13) is

   a) 7 b) 13 c) 26 d) 14

3. Which of the following is not part of the Dirichilet's conditions for the convergence of Fourier series of a periodic signal x(t)?

   a) The signal x(t) must be absolutely integrable over a period.
   b) The signal x(t) must remain bounded.
   c) The signal x(t) must have finite number of maxima and minima in any finite interval.
   d) The signal x(t) must have finite number of discontinuities in any finite interval

4. To a matched filter matched with

   $$f(t) = \begin{cases} 1, & 0 \le t \le T \\ 0, & otherwise \end{cases}$$

   the same signal f(t) (with duration t=T) is applied as the input. Then the output has maximum value at time

   a) t=0 b) t=T/2 c) t=T d) t=2T

5. The time needed for a pulse to rise from 10% to 90% of its maximum amplitude is defined as the

   a) Delay time b) Rise time c) Settling time d) Propagation time

6. In a class B push-pull amplifier, the transistors are biased slightly above cutoff to avoid

   a) Excessive power dissipation b) Excessive efficiency c) Cross over distortion d) None of these

7. If the ac supply is 50 Hz, what will be the ripple frequency out of the full-wave rectifier?

a) 50 b) 60 c) 100 d) 120

8. High frequency gain of RC coupled amplifier falls due to

a) Low R_L b) High C_c c) Low input capacitance d) High junction capacitance

9. A transformer coupled class A amplifier has a maximum theoretical conversion efficiency of

a) 25% b) 50% c) 66.6% d) 75%

10. Fourier transform of a deterministic signal g(t) is G(f). Then the Fourier transform of g(t-2) is

a) $G(f)\exp(j4\pi f)$ b) $G(f)\exp(-j4\pi f)$ c) G(2f) d) G(f-2)

11 If the unit step response of a network is (1-exp(-at))u(t), then its impulse response is

a) a exp(-at) b) a exp(-at) u(t) c) (1/a) exp(-at) u(t) d) (1-a) exp(-at)

12 Which of the following electrical characteristics is not exhibited by an ideal op-amp?

a) Infinite voltage gain b) Infinite bandwidth c) Infinite output resistance d) Infinite slew rate

13 Given that CMRR is 100dB. Input common-mode voltage is 12 V. Differential voltage gain is 4000. Calculate output common-mode voltage.

a) 48V b) 0.48V c) 20 d) 11

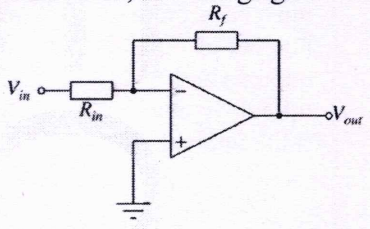
14 Given that for an op-amp the gain is 103, the slew rate is 1.5V/μsec. Input is 0.005sinωt, calculate maximum frequency to prevent distortion.

a) 47.7 kHz b) 0.3 MHz c) 477 Hz d) 3 kHz

15 The output of an op-amp is ___ out of phase with the input connected to the inverting (–) terminal.

a) 0 degree b) 90 degree c) 180 degree d) 270 degree

16 If Rf = Rin, the voltage gain Vout/Vin is ___.



a) 1 b) -1 c) 10 d) Very smalll

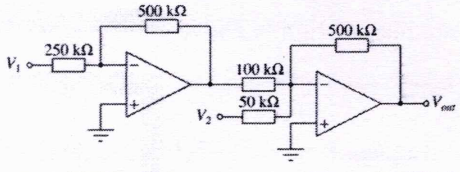
17 The output voltage of an op-amp circuit is always ___ the level of the power supply.

a) Larger than b) Smaller than c) Same as d) None of the above

18 The voltage gain of a buffer amplifier is ___

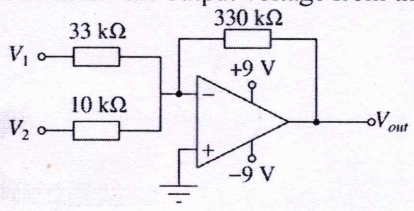
a) 1 b) 0 c) -1 d) 5

19 Determine the output voltage for the below circuit-



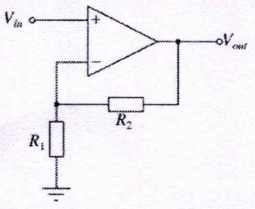
a) $10(V_2-V_1)$ b) $-10(V_2-V_1)$ c) $-10(V_1-V_2)$ d) None of these

20 Determine the output voltage from the circuit below when V1 = V2 = 0.15 V.



a) 0V b) 4.65V c) 6.45V d) -6.45V

21 Calculate the overall voltage gain of the circuit if R1 = 100Ω and R2 = 1 kΩ



a) 10 b) -1 c) 11 d) 9

22 If the feedback voltage and the output voltage are given as 10 V and 4V. Find the gain of the feedback circuit in voltage-series feedback amplifier?

a) 2.5 V b) 40V c) 3 V d) 6.2V

23 Which of the following is done to convert a continuous time signal into discrete time signal?

a) Modulation b) Sampling c) Integration d) None of these

24 The even part of a signal x(t) is?

a) x(t)+x(-t) b) x(t)-x(-t) c) (1/2)*(x(t)+x(-t)) d) (1/2)*(x(t)-x(-t))

25 All energy signals will have an average power of _____

a) Zero b) Infinity c) positive d) Cannot be calculated

26 x(n)*δ(n-k)=.....

a) x(n) b) x(k) c) x(k)*δ(n-k) d) x(k)*δ(k)

27 Time scaling operation is also known as _____

a) Downsampling b) Upsampling c) Sampling d) None of these

28 Which of the following relations are true if x(n) is real?

a) X(ω)=X(-ω) b) X(ω)=-X(-ω) c) X*(ω)=X(ω) d) X*(ω)=X(-ω)

29 If X(ω) is the Fourier transform of the signal x(n), then what is the Fourier transform of the signal x(n-k)?

a) $e^{j\omega k}$. X(-ω) b) $e^{j\omega k}$. X(ω) c) $e^{-j\omega k}$. X(-ω) d) $e^{-j\omega k}$. X(ω)

30 Any signed negative binary number is recognised by its _____

a) MSB b) LSB c) Byte d) Nibble

31 The representation of octal number (532.2)8 in decimal is _____

a) 346.25 b) 532.864 c) 340.67 d) 531.668

32 An important drawback of binary system is _____

a) It requires very large string of 1's and 0's to represent a decimal number
b) It requires sparingly small string of 1's and 0's to represent a decimal number
c) It requires large string of 1's and small string of 0's to represent a decimal number
d) It requires small string of 1's and large string of 0's to represent a decimal number

33 The largest two digit hexadecimal number is _____

a) $(FE)_{16}$ b) $(FD)_{16}$ c) $(FF)_{16}$ d) $(EF)_{16}$

34 In a J-K flip-flop, if J=K the resulting flip-flop is referred to as _____

a) D flip-flop b) S-R flip-flop c) T flip-flop d) S-K flip-flop

35 How many stable states combinational circuits have?

a) 3 b) 2 c) 41 d)

36 The flip-flops which has not any invalid states are _____

a) S-R, J-K, D b) S-R, J-K, T c) J-K, D, S-R d) J-K, D, T

37 What is the minimum number of flip-flops needed to build a MOD-17 up counter?

a) 2 b) 3 c) 4 d) 5

38 What is the counting range of a BCD counter?

a) 0 to 10 b) 1 to 10 c) 0 to 9 d) 1 to 9

39 A ripple counter's speed is limited by the propagation delay of _____

a) Each flip-flop b) All flip-flops and gates c) The flip-flops only with gates d) Only circuit gates

40 How many flip-flops are required to construct a decade counter?

a) 4 b) 8 c) 5 d) 10

41 A cordless telephone using separate frequencies for transmission in base and portable units is known as

a) Duplex arrangement b) Half duplex arrangement c) either a or b d) neither a or b

42 VSB modulation is preferred in TV because

a) It reduces the bandwidth requirement to half b) it avoids phase distortion at low frequencies c) it results in better reception d) none of the above

43 In FM signal with a modulation index m_f is passed through a frequency tripler. The wave in the output of the tripler will have a modulation index of

a) m_f b) $3m_f$ c) $m_f/3$ d) $m_f/9$

44 A 400 W carrier is amplitude modulated with m = 0.75. The total power in AM is

a) 400W b) 512W c) 588W d) 650W

45 Non-coherently detection is not possible for

a) PSK b) ASK c) FSK d) Both (a) and (c)

46 The autocorrelation function of the white noise is

a) Impulse function b) Step function c) Constant d) None of the above

47 DPCM encodes the PCM values based on

a) Quantization level b) Difference between the current and predicted value c) Interval between levels d) None of the mentioned

48 The detector that minimizes the error probability is called as

a) Maximum likelihood detector b) Minimum likelihood detector c) Maximum & Minimum likelihood detector d) None of the mentioned

49 What is the region on the output characteristics below $I_C = I_{CEO}$ line called?

a) Active region b) Cut off region c) Saturation region d) None of these

50 Given that the collector power dissipation is 300 mW, what is the value of collector to emitter voltage for collector current = 50 mA?

a) 6V b) 3V c) 0V d) 2V

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