M/P ENT - 26

Total No. of Pages : 16

Seat No.	

M.Phil./Ph.D. Entrance Examination, May - 2019 (Special Drive)
ELECTRONICS ENGINEERING
(For M.E., M.Tech. Students)

Day and Date : Wednesday, 22 - 05 - 2019 **Total Marks : 100**
Time : 10.00 a.m. to 12.00 noon

Instructions :
1) **All questions are compulsory.**
2) **Each question carries 2 marks.**
3) **Answers should be marked in the given OMR answer sheet by drakening the appropriate option.**
4) **Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR Answer Sheet.**
5) **Follow the instructions given on OMR Answer Sheet.**
6) **Rough work shall be done on the sheet provided at the end of question paper.**
7) **Only non programmable calculators are allowed.**

Research Methodology

1) The first step in formulating a problem is
   A) Statement of the problem
   B) Gathering of Data
   C) Measurement
   D) Survey

2) To ensure adequate informed consent, a researcher should include all of the following components in an introduction except _____.
   A) promise of anonymity and confidentiality
   B) sponsoring organization
   C) purpose of the research
   D) estimate of when the research study will be published

3) _____will help in finding out a problem for research.
   A) Professor B) Tutor
   C) HOD D) Guide

4) What does a descriptive study seek to accomplish?

A) attempts to capture a population's characteristics by making inferences from a sample's characteristics and testing resulting hypotheses.

B) emphasizes a full contextual analysis of a few events or conditions and their interrelations.

C) discovers answers to the questions who, what, when, where, or how much.

D) attempts to reveal why or how one variable produces changes in another.

5) An interval scale contains_____.

A) mutually exclusive and collectively exhaustive categories as well as the property of order, but not distance or unique origin

B) the properties of order, classification, and equal distance between points but no unique origin

C) mutually exclusive and collectively exhaustive categories, but without the properties of order, distance, and origin

D) the properties of classification, order, equal distance, and unique origin

6) Second step in problem formulation is

A) Statement of the problem

B) Understanding the nature of the problem

C) Survey

D) Discussions

7) Last step in problem formulation is

A) Survey

B) Discussion

C) Literature survey

D) Rephrasing the Research problem

8) Which of the following is true of resistant statistics?

A) inappropriate for statistical analysis

B) corrupted with measurement bias

C) based on nominal scales

D) able to resist influence of extreme values

9) Which quartile value(s) are likely to be most different between bell-shaped and highly skewed distributions?

A) The first or third quartile, depending on the skewing.

B) The second quartile or mean.

C) All quartiles.

D) The fourth quartile

10) Which ONE of these is the best description of secondary data?

A) Ordinary data

B) Existing data

C) Omnibus data

D) Ordinal data

11) A _____ is an abstraction formed by generalization from particulars

A) Hypothesis

B) Variable

C) Concept

D) Facts

12) A tentative proposition subject to test is

A) Variable

B) Hypothesis

C) Data

D) Concept

13) What level of measurement would be used if participants were asked to choose their favorite picture from a set of six?

A) Ordinal
B) Nominal
C) Ratio
D) Interval

14) Conclusions from qualitative research are

A) less certain than from quantitative research
B) of little practical use
C) of descriptive value only
D) seldom defensible

15) What is the appropriate test statistic to use to determine the significance of the coefficient of determination in a bivariate regression?

A) F statistic
B) Z score
C) X2
D) ANOVA

16) Concepts which cannot be given operational definitions are _____ concepts

A) Verbal
B) Oral
C) Hypothetical
D) Operational

17) A Hypothesis which develops while planning the research is

A) Null Hypothesis
B) Working Hypothesis
C) Relational Hypothesis
D) Descriptive Hypothesis

18) _____which deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out.

A) Statistical design
B) Observational design
C) Operational design
D) Sampling design

19) The _____ is not used as a measure of association for nominal, nonparametric variables.

A) chi-square
B) phi
C) Cramer's V
D) Z score

20) When a hypothesis is stated negatively it is called

A) Relational Hypothesis
B) Situational Hypothesis
C) Null Hypothesis
D) Casual Hypothesis

21) Hypothesis which explain relationship between two variables is

A) Causal
B) Relational
C) Descriptive
D) Tentative

22) A Hypothesis from which no generalization can be made is

A) Null Hypothesis
B) Barren Hypothesis
C) Descriptive Hypothesis
D) Analytical Hypothesis

23) _____which deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out

A) statistical design

B) observational design

C) operational design

D) sampling design

24) Which of the following is a non-probability sample?

A) Quota sample

B) Simple random sample

C) Purposive sample

D) (A) and (C) both

25) A Hypothesis contributes to the development of_____.

A) Theory

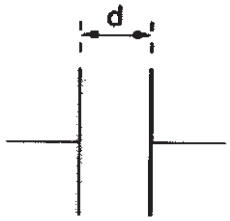
B) Generalization

C) Evolution

D) Concept

Subject Specific

26) The parallel-plate capacitor shown in the figure has movable plates. The capacitor is charged so that the energy stored in it is *E* when the plate separation is *d*. The capacitor is then isolated electrically and the plates are moved such that the plate separation becomes 2*d*.



At this new plate separation, what is the energy stored in the capacitor, neglecting fringing effects?

A) 2E

B) $\sqrt{2}E$

C) E

D) E/2

27) A probability density function is of the form $p(x) = Ke^{-\alpha|x|}, x \in (-\infty, \infty)$. The value of K is

A) 0.5 B) 1

C) 0.5 α D) A

28) A heavily doped n- type semiconductor has the following data:

Hole-electron ratio :0.4

Doping concentration :4.2 x10^8 atoms/m^3

Intrinsic concentration :1.5 xl0^4 atoms/m^3

The ratio of conductance of the *n*-type semiconductor to that of the intrinsic semiconductor of same material and at same temperature is given by

A) 0.00005 B) 2000

C) 10000 D) 20000

29) The electric and magnetic fields for a TEM wave of frequency 14 GHz in a homogeneous medium of relative permittivity ε_r and relative permeability $\mu_r = 1$ are given by

$\bar{E} = E_p e^{j(\omega t - 280\pi y)} \hat{u}_z$ V/m $\bar{H} = 32^{j(\omega t - 280\pi y)} \hat{u}_x$ A/m

Assuming the speed of light in free space to be 3 x 10^8 m/s, the intrinsic impedance of free space to be 120π , the relative permittivity ε_r of the medium and the electric field amplitude E_p are

A) $\varepsilon_r = 3$, $E_p = 120\pi$ B) $\varepsilon_r = 3$, $E_p = 360\pi$

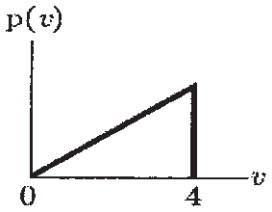
C) $\varepsilon_r = 9$, $E_p = 360\pi$ D) $\varepsilon_r = 9$, $E_p = 120\pi$

30) Consider two identically distributed zero-mean random variables U and V. Let the cumulative distribution functions of U and 2V be F(x) and G(x) respectively. Then, for all values of x

A) $F(x) - G(x) \leq 0$ B) $F(x) - G(x) \geq 0$

C) $(F(x) - G(x)).\ x \leq 0$ D) $(F(x) - G(x)).\ x \geq 0$

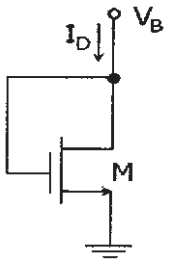
31) An output of a communication channel is a random variable *v* with the probability density function as shown in the figure. The mean square value of *v* is



A) 4 B) 6

C) 8 D) 9

32) The small-signal resistance (i.e., dV_B / dI_D) in kW offered by the n-channel MOSFET M shown in the figure below, at a bias point of V_B =2 V is (device data for M:device Transconductance parameter $k_n = \mu_n C_{ox} (W / L) = 40\mu A/ V^2$ threshold voltage V_{TN}= 1 V and neglect body effect and channel length modulation effects)



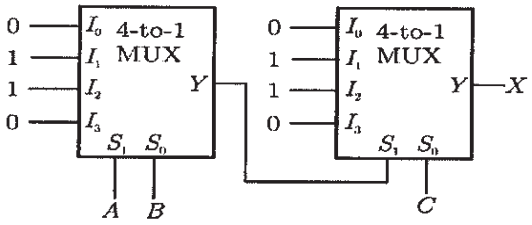
A) 12.5 B) 25

C) 50 D) 100

33) The input x(t) and output y(t) of a system are related as $y(t) = \int_{-\infty}^{t} x(\tau)\cos(3\tau)\,d\tau$. The system is

A) time-invariant and stable
B) time-invariant and not stable
C) not time-invariant and not stable
D) none of the above

34) In the following circuit, X is given by

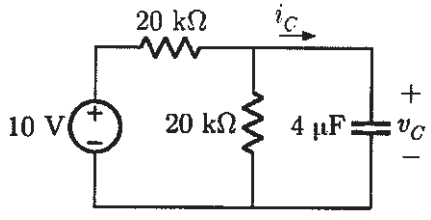


A) $X = A\overline{BC} + \overline{AB}C + \bar{A}B\bar{C} + ABC$
B) $X = \bar{A}BC + A\overline{BC} + AB\bar{C} + \overline{ABC}$
C) $X = \bar{A}B + \bar{B}C + A\bar{C}$
D) $X = A\bar{B} + \overline{BC} + A\bar{C}$

35) During transmission over a certain binary communication channel, bit errors occur independently with probability p. The probability of AT MOST one bit in error in a block of n bits is given by

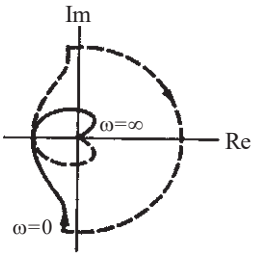
A) p^n
B) $1 - p^n$
C) $np(1-p)^{n-1} + (1+p)^n$
D) $1 - (1-p)^n$

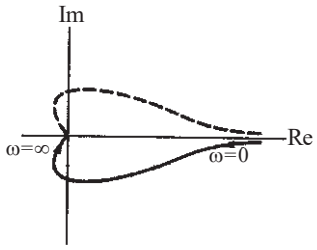
36) In the circuit shown, v_c is 0 volts at t = 0 sec. For t > 0, the capacitor current $i_c(t)$, where t is in seconds is given by

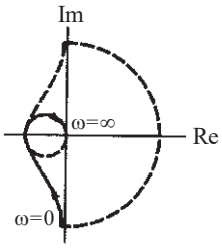


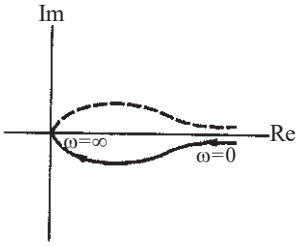
A) 0.50 exp (–25t) mA
B) 0.25 exp (–25t) mA
C) 0.50 exp (–12.5t) mA
D) 0.25 exp (–6.25t) mA

37) Consider a *ufb*system whose open-loop transfer function is $G(s)=\dfrac{k}{s\left(s^2+2s+2\right)}$. The Nyquist plot for this system is

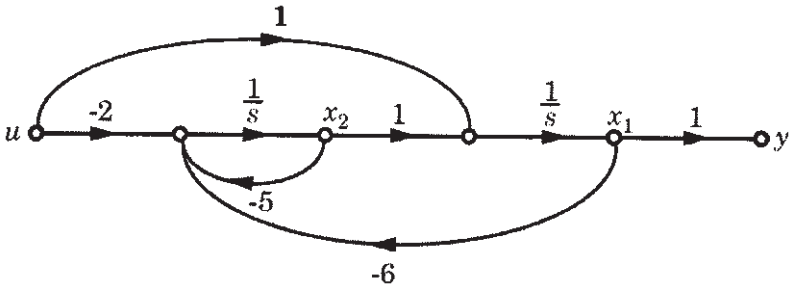
A) 

B) 

C) 

D) 

38) Consider the system shown in fig.



The controllability matrix is

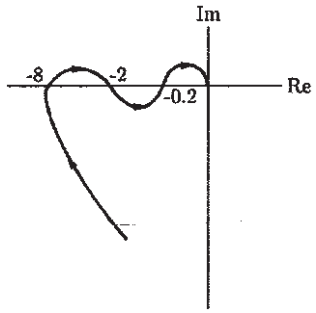
A) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

B) $\begin{bmatrix}1 & -2\\ -2 & 4\end{bmatrix}$

C) $\begin{bmatrix}1 & 0\\ 0 & -1\end{bmatrix}$

D) $\begin{bmatrix}1 & 2\\ -2 & -4\end{bmatrix}$

39) The polar diagram of a conditionally stable system for open loop gain K = 1 is shown in the figure. The open loop transfer function of the system is known to be stable. The closed loop system is stable for



A) $K < 5 \text{ and } \frac{1}{2} < K < \frac{1}{8}$

B) $K < \frac{1}{8} \text{ and } \frac{1}{2} < K < 5$

C) $K < \frac{1}{8} \text{ and } 5 < K$

D) $K > \frac{1}{8} \text{ and } \frac{1}{2} > K$

For Questions Q40, Q41 there are two statements Assertion (A) and Reason (R). Choose

A) Both (A) and (R) are true and (R) is the correct reason for (A)

B) Both (A) and (R) are true and (R) is not correct reason for (A)

C) Both (A) and (R) are true and (R) are false

D) (A) is true but (R) is false

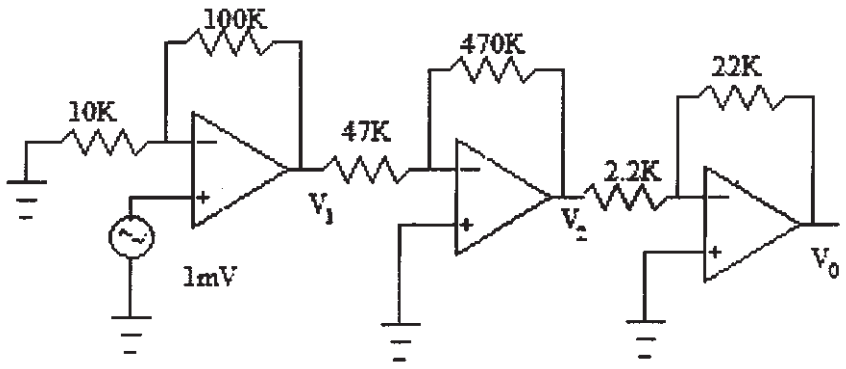
40) Assertion (A) : A system with transfer function H(s) = $\frac{1}{s-2}$, Re (s) > 2 is causal.

Reason (R) : the system is unstable.

41) Assertion (A) : the z-transform of $x(n) = e^{\alpha n} u(n), \alpha > 0$ is $\frac{1}{1 - z^{-1} e^{\alpha}} |z| > e^{\alpha}$

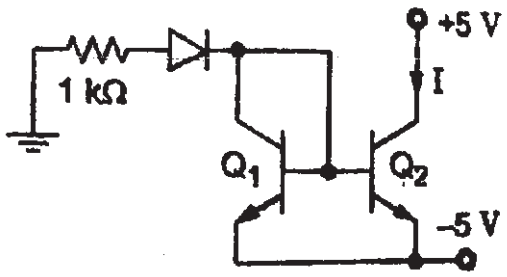
Reason (R): Fourier transform of $x(n)$ is $\frac{1}{1 - e^{\alpha} e^{-j\omega}}$.

42) What is the output voltage V_o of the circuit below



A) –1.1 V
B) +1.1 V
C) 1.0 V
D) 10 V

43) Two Perfectly matched silicon transistor are connected as shown in the figure. Assuming the β of the transistor to be very high and the forward voltage drop in the diodes to be 0.7V the value of current I is



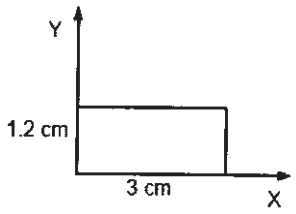
A) 0 mA
B) 3.6 mA
C) 4.3 mA
D) 5.6 mA

44) If β_{DC} is increased by 10%, the collector-to-emitter voltage drop

A) increases by less than or equal to 10%
B) decrcases by less than or equal to 10%
C) increases by more than 10%
D) decreases by more than 10%

45) The magnetic field along the propagation direction inside a rectangular waveguide with the crosssection shown in the figure is

$$H_z = 3\cos\left(2.094\times10^2 x\right)\cos\left(2.618\times10^2 y\right)\cos\left(6.283\times10^{10}t-\beta z\right)$$

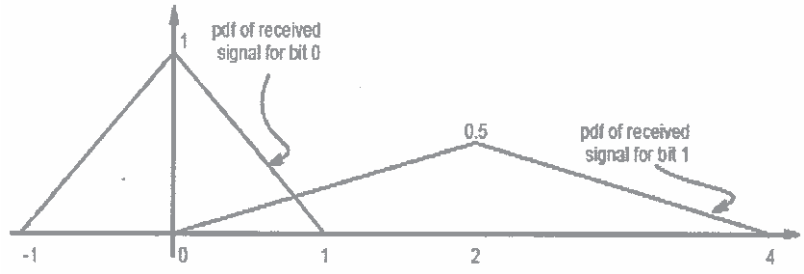


The phase velocity v_p of the wave inside the waveguide satisfies

A) $v_p > c$ B) $v_p = c$

C) $0 < v_p < c$ D) $v_p = 0$

46) Bits 1 and 0 are transmitted with equal probability. At the receiver, the pdf of the respective received signals for both bits are as shown below



If the detection threshold is 1, the Bit Error Rate (BER) will be

A) $\frac{1}{2}$ B) $\frac{1}{4}$

C) $\frac{1}{8}$ D) $\frac{1}{16}$

47) In a Direct Sequence CDMA system the chip rate is 1.2288 x 10^6 chips per second. If the processing gain is desired to be AT LEAST 100, the data rate

A) must be less than or equal to 12.288x10^3 bits per sec

B) must be greater than 12.288 x 10^3 bits per sec

C) must be exactly equal to 12.288 x10^3 bits per sec

D) can take any value less than 122.88x10^3 bits per sec

48) For a signal x(t) the Fourier transform is X(f). Then the inverse Fourier transform of X(3f+ 2) is given by

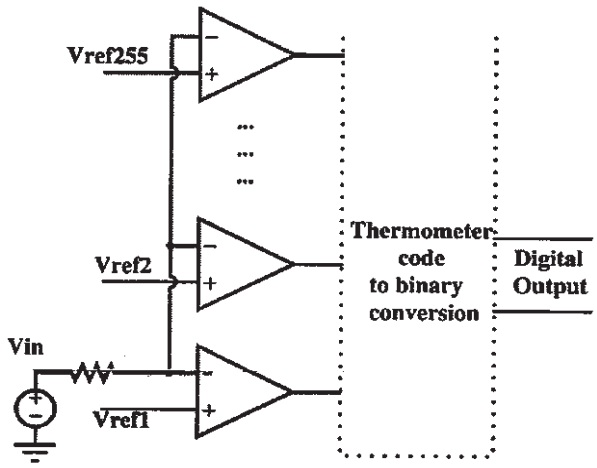
A) $\frac{1}{2}x\left(\frac{t}{2}\right)e^{j3\pi t}$

B) $\frac{1}{3}x\left(\frac{t}{3}\right)e^{-\frac{j4\pi t}{3}}$

C) $3x(3t)e^{-j4\pi t}$

D) $\frac{1}{3}x\left(\frac{t}{3}\right)e^{\frac{j\pi t}{3}}$

49) In an N bit flash ADC, the analog voltage is fed simultaneously to $2^N - 1$ comparators. The output of the comparators is then encoded to a binary format using digital circuits. Assume that the analog voltage source V_{in} (whose output is being converted to digital format) has a source resistance of 75 Ω as shown in the circuit diagram below and the input capacitance of each comparator is 8 pF. The input must settle to an accuracy of 1/2 LSB even for a full scale input change for proper conversion. Assume that the time taken by the thermometer to binary encoder is negligible.



If the flash ADC has 8 bit resolution, which one of the following alternatives is closest to the maximum sampling rate?

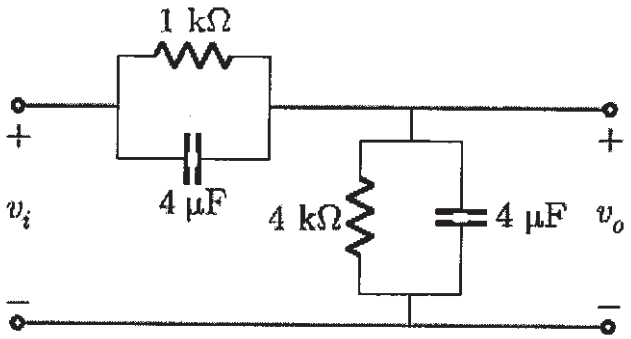
A) 1 megasamples per second

B) 6 megasamples per second

C) 4 megasamples per second

D) 16 megasamples per second

50) In the figure shown below, assume that all the capacitors are initially uncharged. If $v_i(t) = 10u(t)$ Volts, $v_o(t)$ is given by



A) $8e^{-t/0.004}$ Volts

B) $8\left(1-e^{-t/0.004}\right)$ Volts

C) 8u (t) Volts

D) 8 Volts

❍❍❍❍

Rough Work