M/P ENT - 24

Total No. of Pages : 16

Seat No.	

M.Phil./Ph.D. Entrance Examination, May - 2019 (Special Drive)
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Day and Date : Tuesday, 21 - 05 - 2019 **Total Marks : 100**
Time : 4.00 p.m. to 6.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Each question carries 2 marks.**
3) **Answers should be marked in the given OMR answer sheet by darkening 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 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) _____which concerns with the question of how many items are to be observed and how the information and data gathered are to be analyzed.

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

2) The variables are ones that have a strong continent effect on the relationship between the independent variable and dependent variable. They have potential to modify the direction and magnitude of the above stated association.

A) Moderating variables B) Inverting variables
C) Extraneous variable D) None of the above

3) _____ involve random selection.

A) Probability Sampling B) Non-probability Sampling
C) Purposive Sampling D) None of these

4) Parametric test, unlike the non-parametric tests. make certain assumptions about

A) The population size
B) The underlying distribution
C) The sample size
D) None of the above

5) Two types of errors associated with hypothesis testing are Type I and Type II. Type II error is committed when

A) We reject the null hypothesis whilst the alternative hypothesis is true
B) We reject a null hypothesis when it is true
C) We accept a null hypothesis when it is not true
D) None of the above

6) The null hypothesis of the sign test is that

A) Half the ranks to be less than the median and half greater than the median
B) Half the ranks to be less than the mean and half greater than the mean
C) The lower half the ranks to have the same mean as the upper half
D) The lower half the ranks to have the same standard deviation as the upper half

7) What is an effect size?

A) The magnitude of the relationship between variables
B) The likelihood of type I and type 2 errors
C) The number of expected cases
D) The variance explained by the measures

8) What does a significant result in a chi-square test imply?

A) That homogeneity of variance has not been established

B) That there is a significant difference between the three categorical variables included in the analysis

C) It implies that the sample is not representative of the population

D) All of these are possible

9) One or two tail test will determine

A) If the two extreme values (min or max) of the sample need to be rejected

B) if the hypothesis has one or possible two conclusions

C) If the region of rejection is located in one or two tails of the distribution

D) None of the above

10) What are the two types of variance which can occur in your data?

A) Between or within groups

B) Repeated and extraneous

C) Experimenter and participant

D) Independent and confounding

11) You obtained a significant test statistic when comparing three treatments in a one-way ANOVA. In words, how would you interpret the alternative hypothesis HA?

A) All three treatments have different effects on the mean response.

B) Exactly two of the three treatments have the same effect on the mean response.

C) At least two treatments are different from each other in terms of their effect on the mean response.

D) All of the above.

12) What is the function of a post-test in ANOVA?

A) Determine if any statistically significant group differences have occurred.

B) Describe those groups that have reliable differences between group means.

C) Set the critical value for the F test (or chi-square).

D) None of the above

13) Which ONE of these techniques is most likely to be used in quantitative analysis?

A) Multivariate analysis.

B) Sound-tape recordings.

C) Transcripts.

D) Videos.

14) In Testing the statistical hypothesis, which of the following statement is false

A) The critical region is the values of the test statistic for which we reject null hypothesis.

B) The level of significance is the probability of type I error

C) The p-value measures the probability that the null hypothesis is true

D) None of the above

15) 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 wil1 be published

16) 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

17) 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

18) 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

19) Which quartile value(s) are likely to be most different between bell-shaped and highl 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

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

A) Ordinary data.
B) Existing data.
C) Omnibus data
D) Ordinal data.

21) 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

22) 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.

23) 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

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

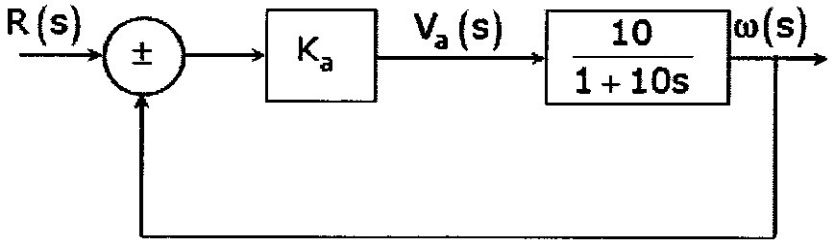
A) statistical design
B) observational design
C) operational design
D) sampling design

25) 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

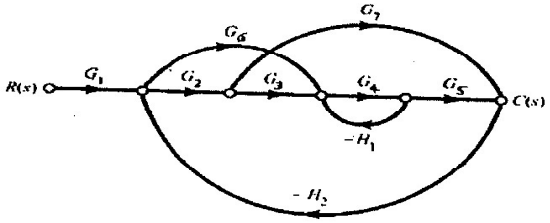
Subject Specific

26) The open-loop transfer function of a dc motor is given as $\frac{\omega(s)}{V_a(s)} = \frac{10}{1+10s}$ when connected in feedback as shown below, the approximate value of K_a that will reduce the time constant of the closed loop system by one hundred times as compared to that of the open-loop system is



A) 1
B) 5
C) 10
D) 100

27) The signal flow graph for a system is given below. The transfer function $\frac{C(s)}{R(s)}$ for this system is



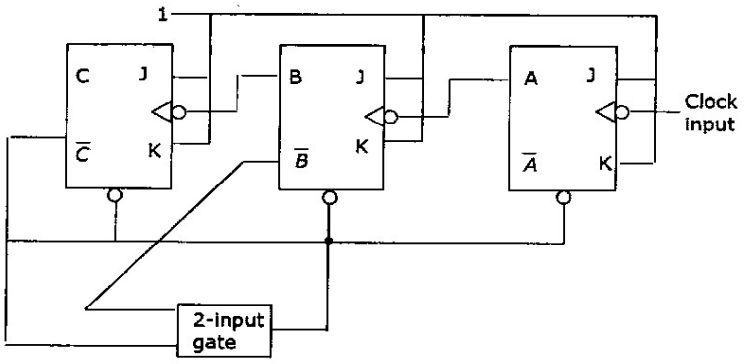
A) $\frac{G_1G_2G_3G_4G_5 + G_1G_6G_4G_5 + G_1G_2G_7(1+G_4H_1)}{1+G_4H_1+G_2G_7H_2+G_6G_5G_4H_2+G_2G_3G_4G_5H_2+G_4H_1G_2G_7H_2}$

B) $\frac{G_1G_2G_3G_4G_5 + G_1G_6G_4G_5 + G_1G_2G_7(1+G_4H_1)}{1+G_4H_1+G_6G_5G_4H_2+G_2G_3G_4G_5H_2+G_4H_1G_2G_7H_2}$

C) $\frac{G_1G_2G_3G_4G_5 + G_1G_6G_4G_5 + G_1G_2G_7(1+G_4H_2)}{1+G_4H_1+G_2G_7H_2+G_6G_5G_4H_2+G_1G_3G_4G_5H_2+G_4H_1G_2G_7H_2}$

D) $\frac{G_1G_2G_3G_4G_5 + G_1G_6G_4G_5 + G_1G_2G_7(1+G_2G_7H_1)}{1+G_4H_1+G_2G_7H_2+G_6G_7G_4H_2+G_2G_3G_4G_5H_2+G_4H_1G_2G_7H_2}$

28) In the modulo-6 ripple counter shown in figure, the output of the 2-input gate is used to clear the J-K flip-flop. The 2-input gate is

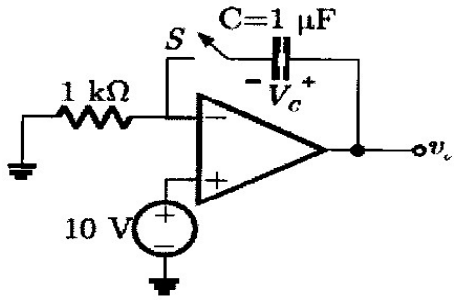


A) a NAND gate
B) a NOR gate
C) an OR gate
D) an AND gate

29) 11001, 1001, 111001 correspond to the 2's complement representation of which one of the following sets of number

A) 25,9, and 57 respectively
B) -6, -6, and -6 respectively
C) -7, -7 and -7 respectively
D) -25, -9 and -57 respectively

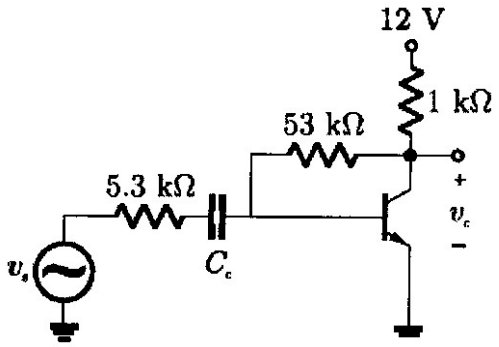
30) For the circuit shown in the following figure, the capacitor C is initially uncharged. At t = 0 the switch S is closed. The V_c across the capacitor at t = 1 millisecond is In the figure shown above, the OP-AMP is supplied with ±15V.



A) 0 Volt
B) 6.3 Volt
C) 9.45 Volts
D) 10 Volts

31) In the transistor amplifier circuit shown in the figure below, the transistor has the following parameters: $\beta_{DC} = 60$, $V_{BE} = 0.7V$, $h_{ie} \rightarrow \infty$

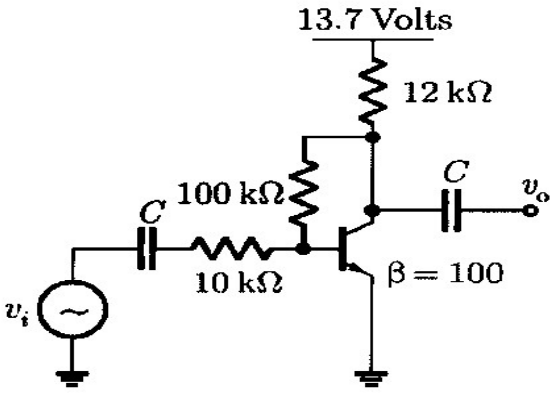
The capacitance C_C can be assumed to be infinite.



Under the DC conditions, the collector-or-emitter voltage drop is

A) 4.8 Volts
B) 5.3 Volts
C) 6.0 Volts
D) 6.6 Volts

32) The voltage gain A_v of the circuit shown below is



A) $|A_v| \approx 200$
B) $|A_v| \approx 100$
C) $|A_v| \approx 20$
D) $|A_v| \approx 10$

33) The minimum step-size required for a Delta-Modulator operating at 32k samples/sec to track the signal (here $u(t)$ is the unit-step function)

$x(t)=125\left[u(t)-u(t-1)+(250t)\left[u(t-1)-u(t-2)\right]\right.$ so that slope-overload is avoided would be

A) 2^{-10} B) 2^{-8}

C) 2^{-6} D) 2^{-4}

34) At a given probability of error, binary coherent FSK is inferior to binary coherent PSK by.

A) 6 dB B) 3 dB

C) 2 dB D) 0 dB

35) A DSB-SC signal is to be generated with a carrier frequency $f_c = 1$ MHz using a non-linear device with the input-output characteristic $V_0 = a_0 v_i + a_1 v_i^3$ where a_0 and a_1 are constants. The output of the non-linear device can be filtered by an appropriate band-pass filter. Let $V_i = A_c^i \cos\left(2\pi f^i c^t\right) + m(t)$ is the message signal. Then the value of f_c^i (in MHz) is

A) 1.0 B) 0.333

C) 0.5 D) 3.0

36) A voltage V_G is applied across a MOS capacitor with metal gate and p-type silicon substrate at T = 300 K. The inversion carrier density (in number of carriers per unit area) for V_G = 0.8 V is 2×10^{11} cm^{-2}. For V_G = 1.3 V, the inversion carrier density is 4×10^{11} cm^{-2}. What is the value of the inversion carrier density for V_G = 1.8 V?

A) 4.5×10^{11} cm^{-2} B) 6.0×10^{11} cm^{-2}

C) 7.2×10^{11} cm^{-2} D) 8.4×10^{11} cm^{-2}

37) The Bandgap of silicon at 300 K is

A) 1.36 eV B) 1.10 eV

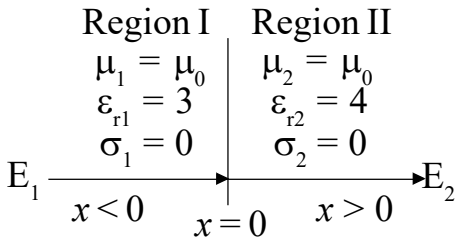
C) 0.80 eV D) 0.67 eV

38) An n-type silicon bar 0.1 cm long and 100 μm^2i cross-sectional area has a majority carrier concentration of $5 \times 10^{20}/m^2$ and the carrier mobility is 0.13 m^2/V-s at 300 K. If the charge of an electron is 1.5×10^{-19} coulomb, then the resistance of the bar is

A) 10^6 Ohm B) 10^4 Ohm

C) 10^{-1} Ohm D) 10^{-4} Ohm

39) A medium is divide into regions I and II about $x = 0$ plane, as shown in the figure below.



An electromagnetic wave with electric field $E_1 = 4\hat{a}_x + 3\hat{a}_y + 5\hat{a}_z$ is incident normally on the interface from region I. The electric file E_2 in region II at the interface is

A) $E_2 = E_1$ B) $4\hat{a}_x + 0.75\hat{a}_y - 1.25\hat{a}_z$

C) $3\hat{a}_x + 3\hat{a}_y + 5\hat{a}_z$ D) $-3\hat{a}_x + 3\hat{a}_y + 5\hat{a}_z$

40) When a planes wave traveling in free-space is incident normally on a medium having the fraction of power transmitted into the medium is given by

A) $\frac{8}{9}$ B) $\frac{1}{2}$

C) $\frac{1}{3}$ D) $\frac{5}{6}$

41) A rectangular wave guide having TE_{10} mode as dominant mode is having a cut off frequency 18 GHz for the mode TE_{30}. The inner broad-wall dimension of the rectangular wave guide is

A) 5/3 cm

B) 5 cm

C) 5/2 cm

D) 10 cm

42) A two-port network is represented by ABCD parameters given by

$$\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} V_2 \\ -I_2 \end{bmatrix}$$

If port-2 is terminated by R_L, the input impedance seen at port-1 is given by

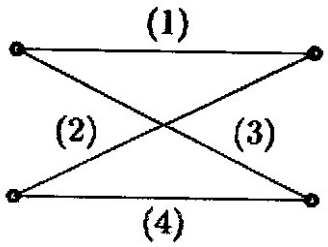
A) $\dfrac{A + BR_L}{C + DR_L}$

B) $\dfrac{AR_L + C}{BR_L + D}$

C) $\dfrac{DR_L + A}{BR_L + C}$

D) $\dfrac{B + AR_L}{D + CR_L}$

43) In the following graph, the number of trees (P) and the number of cut-set (Q) are



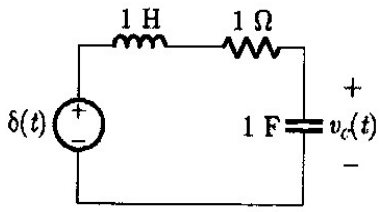
A) P = 2, Q = 2

B) P = 2, Q = 6

C) P = 4, Q = 6

D) P = 4, Q = 10

44) The following series RLC circuit with zero conditions is excited by a unit impulse functions δ(t).



For t > 0, the output voltage $v_c(t)$ is

A) $\frac{2}{\sqrt{3}}\left(e^{-\frac{1}{2}t} - e^{-\frac{\sqrt{3}}{2}t}\right)$

B) $\frac{2}{\sqrt{3}}\left(te^{-\frac{1}{2}t}\right)$

C) $\frac{2}{\sqrt{3}}e^{-\frac{1}{2}t}\cos\left(\frac{\sqrt{3}}{2}t\right)$

D) $\frac{2}{\sqrt{3}}e^{-\frac{1}{2}t}\sin\left(\frac{\sqrt{3}}{2}t\right)$

45) Three companies X, Y and Z supply computers to a university. The percentage of computers supplied by them and the probability of those being defective are tabulated below.

Company	% of Computer Supplied	Probability of being supplied defective
X	60%	0.01
Y	30%	0.02
Z	10%	0.03

Give that a computer is defective, the probability that was supplied by Y is

A) 0.1

B) 0.2

C) 0.3

D) 0.4

46) A linear system is described by the following state equation

$$\dot{X}(t) = AX(t) = BU(t),\ A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

The state transition matrix of the system is

A) $\begin{bmatrix} \cos t & \sin t \\ -\sin t & \cos t \end{bmatrix}$

B) $\begin{bmatrix} -\cos t & \sin t \\ -\sin t & -\cos t \end{bmatrix}$

C) $\begin{bmatrix} -\cos t & -\sin t \\ -\sin t & \cos t \end{bmatrix}$

D) $\begin{bmatrix} \cos t & -\sin t \\ \sin t & \cos t \end{bmatrix}$

47) The impulse response h[n] of a linear time-invariant system is given by h[n] = u [n + 3] + u [n – 2] – 2n [n – 7] where u [n] is the unit step sequence. The above system is

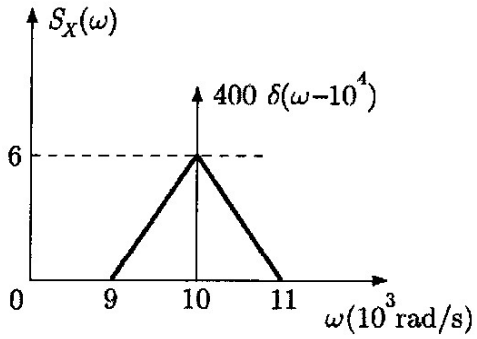
A) stable but not causal

B) stable and causal

C) causal but unstable

D) unstable and not causal

48) The power spectral density of a real process X(t) for positive frequencies is shown below. The values of E[X 2(t)] and E[X(t)[, respectively, are



A) 6000/π,0

B) 6400/π, 0

C) $6400/\pi, 20/\left(\pi\sqrt{2}\right)$

D) $6000/\pi, 20/\left(\pi\sqrt{2}\right)$

49) In the derivation of expression for peak percent overshoot

$$M_p = \exp\left(\frac{-\pi\xi}{\sqrt{1-\xi^2}}\right) \times 100\%$$

Which one of the following conditions in NOT required?

A) System is linear and time invariant

B) The system transfer function has a pair of complex conjugate poles and no zeros.

C) There is no transportation delay in the system

D) The system has zero initial conditions

50) The gain margin for the system with open-loop transfer function

$$G(s)H(s) = \frac{2(1+s)}{s^2}$$

A) 3 B) 0

C) 1 D) –3

⌘⌘⌘

Rough Work