Test Booklet Series **Test Booklet No.**

A

Test Booklet
(Electronics and Communication Engg.)

Name of Applicant ..... Answer Sheet No. .....

Applicant ID/Roll No. : ..... Signature of Applicant : .....

Date of Examination : ..... Signature of the Invigilator(s)

Time of Examination : ..... 1. .....

2. .....

Duration : 2 Hour] **[Maximum Marks : 100**

IMPORTANT INSTRUCTIONS

(i) The question paper is in the form of Test-Booklet containing **100 (Hundred)** questions. All questions are compulsory. Each question carries four answers marked (A), (B), (C) and (D), out of which only one is correct. Choose the correct option or the most appropriate option.

(ii) On receipt of the Test-Booklet (Question Paper), the candidate should immediately check it and ensure that it contains all the pages, i.e., **100** questions. Discrepancy, if any, should be reported by the candidate to the invigilator immediately after receiving the Test-Booklet.

(iii) A separate Answer-Sheet is provided with the Test-Booklet/Question Paper. On this sheet there are **100** rows containing four circles each. One row pertains to one question.

(iv) The candidate should write his/her Application ID/Roll number at the places provided on the cover page of the Test-Booklet/Question Paper and on the Answer-Sheet and NOWHERE ELSE.

(v) No second Test-Booklet/Question Paper and Answer-Sheet will be given to a candidate. The candidates are advised to be careful in handling it and writing the answer on the Answer-Sheet.

(vi) For every correct answer of the question **One (1) mark will be awarded**.

(vii) Marking shall be done only on the basis of answers responded on the Answer-Sheet.

(viii) To mark the answer on the Answer-Sheet, candidate should darken the appropriate circle in the row of each question with Blue or Black pen.

(ix) For each question only **one** circle should be **darkened** as a mark of the answer adopted by the candidate. If more than one circle for the question are found darkened or with one black circle any other circle carries any mark, the answer will be treated as incorrect.

(x) The candidates should not remove any paper from the Test-Booklet/Question Paper. Attempting to remove any paper shall be liable to be punished for use of unfair means.

(xi) Rough work may be done on the blank space provided in the Test-Booklet/Question Paper only.

(xii) *Mobile phones (even in Switch-off mode) and such other communication/programmable devices are not allowed inside the examination hall.*

(xiii) No candidate shall be permitted to leave the examination hall before the expiry of the time.

DO NOT OPEN THIS QUESTION BOOKLET UNTIL ASKED TO DO SO.

PART–A

1. Research is
   (A) Searching again and again
   (B) Finding a solution to any problem
   (C) Working in a scientific way to search for the truth of any problem
   (D) None of the above

2. The conceptual framework in which research is conducted is called a
   (A) Synopsis of research
   (B) Research design
   (C) Research hypothesis
   (D) Research paradigm

3. What are the main characteristics of Scientific Research?
   (A) Empirical
   (B) Theoretical
   (C) Experimental
   (D) All the above

4. Which research design will be most appropriate to study the relationship between the level of aspirations and achievement of rural children?
   (A) Experimental Research Design
   (B) Ex Post Facto Research Design
   (C) Historical Research Design
   (D) Survey Research Design

5. The principles of fundamental research are used in:
   (A) action research
   (B) applied research
   (C) philosophical research
   (D) historical research

6. A shift in attitude in respondents between two points during data collection is called
   (A) Reactive effect
   (B) Maturation effect
   (C) Regression effect
   (D) Conditioning effect

7. Ethical Norms in research do not involve guideline for:
   (A) Thesis Format
   (B) Copyright
   (C) Patenting Policy
   (D) Data sharing Policy

8. The primary objective of an experimental research design is to:
   (A) Explore an unknown topic.
   (B) Establish cause-and-effect relationships.
   (C) Describe a population or situation.
   (D) Examine the relationship between variables without manipulation.

9. The research that aims at immediate application is:
   (A) Action Research
   (B) Empirical Research
   (C) Conceptual Research
   (D) Fundamental Research

10. A null hypothesis is
   (A) when there is no difference between the variables
   (B) the same as research hypothesis
   (C) subjective in nature
   (D) when there is difference between the variables

11. When the researcher rejects a true null hypothesis a ---------- error occurs.
   (A) Type I
   (B) Type A
   (C) Type II
   (D) Type B

12. The researcher is usually interested in supporting ..... when he or she is engaging in hypothesis testing:
   (A) The alternative Hypothesis
   (B) The null Hypothesis
   (C) Both alternative and null Hypothesis
   (D) Neither the alternative or null Hypothesis

13. A research design is often described as the "blueprint" for a research project. This emphasizes its role in:
   (A) Collecting data
   (B) Analysing data
   (C) Providing a strategy and framework for the study
   (D) Presenting findings

14. What is a cross-sectional research design?
(A) A design in which a data is collected at one point of time.
(B) A design in which data is collected over a period of time.
(C) A design in which data is collected from a representative sample of the population.
(D) A design in which data is collected from a non-representative sample of the population.

15. Match the measurement scale to the given variables:

Scale of measurement	**Variable**
(a) Nominal	(i) Height of student
(b) Ordinal	(ii) Time of day
(c) Interval	(iii) Caste
(d) Ratio	(iv) Rank of Army Personnel

Choose the correct answer from the options given below:
(A) (a) – (i), (b) – (ii), (c) – (iii), (d) – (iv)
(B) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)
(C) (a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)
(D) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)

16. Which is the simplest form of Measurement?
(A) Ordinal (B) Nominal
(C) Ratio (D) Interval

17. The data is obtained through a survey conducted is called:
(A) Primary data (B) Secondary data
(C) Continuous data (D) Qualitative data

18. A survey in which the information is collected from each and every individual of the population is known as:
(A) Sample survey (B) Pilot survey
(C) Biased survey (D) Census survey

19. Interview is an example of which data?
(A) Primary data (B) Secondary data
(C) Both (A) and (B) (D) None of the above

20. What is the process of organizing raw data into rows and columns for systematic analysis called?
(A) Compilation
(B) Presentation
(C) Tabulation
(D) Classification

21. The graphical representation of a frequency distribution is called
(A) Bar chart
(B) Line chart
(C) Histogram
(D) Pie char

22. Identify the correct sequence of research steps:
(A) Selection of topic, review of literature, data collection, interpretation of findings
(B) Review of literature, selection of topic, data collection, and interpretation of findings
(C) Selection of topic, data collection, review of literature, interpretation of findings
(D) Selection of topic, review of literature, interpretation of findings, data collection

23. When a research problem is related to heterogeneous population, the most suitable sampling method is:
(A) Cluster Sampling
(B) Stratified Sampling
(C) Convenient Sampling
(D) Lottery Method

24. A researcher wants to study the long-term effects of a new teaching method on student performance over several years. Which research design would be most appropriate?
(A) Cross-sectional design
(B) Case study design
(C) Longitudinal design
(D) Survey design

25. From the list given below identify those which are called non-probability sampling procedures:
(i) Simple random sampling
(ii) Dimensional sampling
(iii) Snowball sampling
(iv) Cluster sampling
(v) Quota sampling
(vi) Stratified sampling
Choose the correct option
(A) (i), (ii) and (iii)
(B) (ii), (iv) and (v)
(C) (i), (iii) and (v)
(D) (ii). (iii) and (v)

26. Among the following types of sampling techniques, which one is also known as 'Judgmental' sampling?

(A) Quota sampling
(B) Convenience Sampling
(C) Cluster Sampling
(D) Purposive Sampling

27. The primary objective of an experimental research design is to:

(A) Explore an unknown topic.
(B) Establish cause-and-effect relationships.
(C) Describe a population or situation.
(D) Examine the relationship between variables without manipulation.

28. "Students from the pure mathematics background can crack a bank recruitment test"—Which type of hypothesis is this?

(A) Relational Hypothesis
(B) Descriptive hypothesis
(C) Two tailed Hypothesis
(D) Null Hypothesis

29. Parametric tests make assumptions on:

(A) The population size
(B) The underlying distribution
(C) The sample size
(D) The mean sample

30. If the researcher has a nominal data, which non parametric test will he/she can use:

(A) T-test
(B) Z-test
(C) Chi square test
(D) All the above

31. If a researcher needs to verify whether there is a significant difference between the means of two groups to test a hypothesis, which statistical method would he/she employ?

(A) Chi-square test
(B) Correlation coefficient
(C) Sign-test
(D) Student's t-test

32. Chi-square is used to analyse:

(A) Scores (B) Ranks

(C) Frequencies (D) None of these

33. On which of the following does the critical value for a chi-square statistic rely?

(A) The degrees of freedom (B) The sum of the frequencies

(C) The row totals (D) The number of variables

34. Calculated value of chi-square is always.....

(A) Positive (B) Negative

(C) Zero (D) None of these

35. Which of the following best describes the purpose of using ANOVA in research?

(A) ANOVA is used to compare the means of two groups.

(B) ANOVA is use to compare the means of more than two groups.

(C) ANOVA is used to determine the correlation between two variables.

(D) ANOVA is used to determine the interaction effect between dependent variables.

36. What do ANOVA calculate?

(A) T-Ratio (B) Chi-square

(C) Z-Ratio (D) F-Ratio

37. What is the primary goal of factor analysis?

(A) To predict a dependent variable from multiple independent variables.

(B) To reduce a large number of variables into a smaller set of underlying factors.

(C) To determine the causal relationship between variables.

(D) To calculate the correlation between two variables.

38. Which assumption is required for factor analysis?

(A) Extreme collinearity exists among variables.

(B) Variables have a skewed distribution.

(C) A linear relationship exists among variables.

(D) There are many outliers in the data.

39. When using Principal Component Analysis (a common method for factor analysis), what does the first principal component capture?
(A) The minimum variance.
(B) The mean deviation.
(C) The maximum variance.
(D) The average variance.

40. Which statistical measure is used to assess the sampling adequacy for conducting factor analysis?
(A) Kaiser-Meyer-Olkin (KMO) measure.
(B) Bartlett's test of sphericity.
(C) Eigenvalue.
(D) All of the above.

41. The process by which we estimate the value of dependent variable on the basis of one or more independent variable is called:
(A) Correlation
(B) Regression
(C) Residual
(D) Slope

42. The major characteristic of correlation analysis is to seek out
(A) Differences among variables
(B) Variations among variables
(C) Association among variables
(D) Regression among variables

43. A correlation coefficient (r) of –1.0 indicates a:
(A) Perfect positive correlation
(B) Weak positive correlation
(C) No correlation
(D) Perfect negative correlation

44. The statistical tool that studies the degree of association between two variables is called:
(A) Regression
(B) Standard error
(C) Index numbers
(D) Correlation

45. Which type of correlation analysis is appropriate for examining the relationship between variables with non-linear relationships?
(A) Pearson's correlation
(B) Spearman's rank correlation
(C) Both Pearson's and Spearman's
(D) Neither Pearson's nor Spearman's

46. What is the primary goal of cluster analysis?
    (A) Classifying data into predefined groups.
    (B) Predicting a continuous value.
    (C) Grouping similar data points together based on their characteristics.
    (D) Reducing the number of variables in a dataset.

47. The primary purpose of conjoint analysis is to:
    (A) Identify which customer segments are most profitable.
    (B) Determine the price elasticity of demand for an existing product.
    (C) Quantify the value that consumers place on different features of a product or service.
    (D) Predict sales volume for a new product with absolute certainty.

48. The most common type of conjoint analysis, which presents respondents with sets of product profiles and asks them to choose the one they prefer most, is known as:
    (A) Adaptive Conjoint Analysis (ACA).
    (B) Choice-Based Conjoint (CBC).
    (C) Full-Profile Conjoint Analysis.
    (D) Self-Explicated Conjoint Analysis.

49. Which statement is an accurate representation of a "trade-off" in conjoint analysis?
    (A) A decision to buy a product from one brand over another.
    (B) A decision to delay a purchase until a later date.
    (C) A customer choosing a larger screen over longer battery life for a phone.
    (D) A customer buying a product with all the most desired features.

50. What is the primary purpose of discriminant analysis?
    (A) To determine the effect of independent variables on a continuous dependent variable.
    (B) To identify the underlying structure or dimensions within a set of variables.
    (C) To classify cases into two or more distinct, pre-defined groups based on a set of predictor variables.
    (D) To cluster data points into a specific number of groups based on their similarities.

PART–B

(Electronics and Communication Engg.)

51. In the following circuit as shown in Fig. 1, if v_{s1} = 6 V and v_{s2} = −6V then the value of v_a is

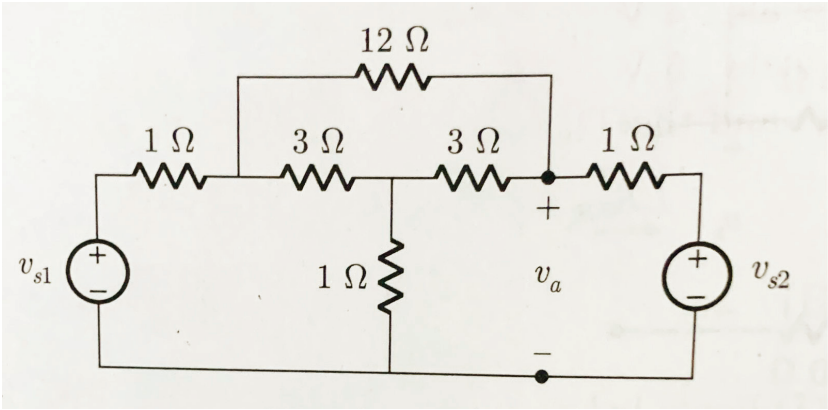

Fig. 1

(A) 6 V (B) −6 V

(C) 3 V (D) −4 V

52. In the given circuit as shown in Fig. 2 initially capacitor is uncharged. The $v_C(t)$ for $t \geq 0$ is

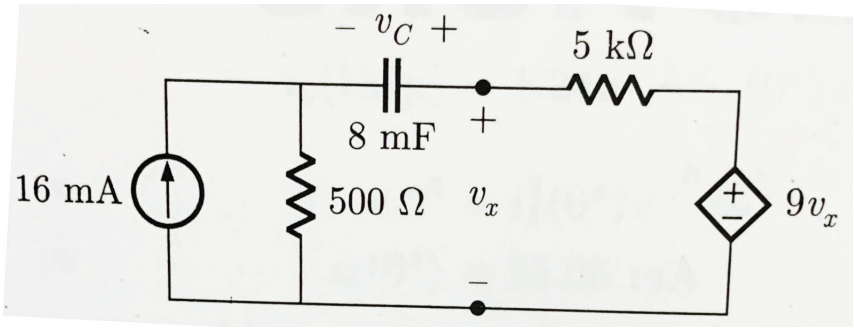

Fig. 2

(A) $(-8 + 8e^{-t})$ V (B) $(8 + 8e^{-t})$ V

(C) 8 V (D) $(-8 - 8e^{-t})$ V

53. The current through an 4 H inductor is given by $I_L(s) = \frac{10}{s(s+2)}$. The initial voltage across the inductor is

(A) 0 V (B) 10 V

(C) 40 V (D) 25 V

54. The equivalent inductance of a pair of coupled inductor in various configuration are

(i) 7 H after series adding connection.

(ii) 1.8 H after series opposing connection.

(iii) 0.5 H after parallel connection with dotted terminal connected together.

The value of L_1, L_2 and M are

(A) 3 H, 1.6 H, 1.2 H (B) 3.7 H, 0.7 H, 1.3 H

(C) 1.6 H, 3 H, 1.4 H (D) 2 H, 3 H, 3 H

55. The T-parameter of a 2-port network are

$$[T] = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$$

if such two 2-port network are cascaded, the z-parameter for the cascaded network is

(A) $\begin{bmatrix} 2 & -2 \\ -\frac{1}{2} & 1 \end{bmatrix}$ (B) $\begin{bmatrix} \frac{5}{3} & -\frac{5}{3} \\ -\frac{1}{3} & \frac{2}{3} \end{bmatrix}$

(C) $\begin{bmatrix} \frac{5}{3} & \frac{1}{3} \\ \frac{1}{3} & \frac{2}{3} \end{bmatrix}$ (D) $\begin{bmatrix} 2 & 2 \\ \frac{1}{2} & 1 \end{bmatrix}$

56. An electronic test circuit produced a resonant curve with half power points at 434 Hz and 456 Hz. If Q = 20, the resonant frequency of the circuit is

(A) 22 Hz (B) 440 Hz

(C) 220 Hz (D) 450 Hz

57. The first and the last critical frequency of an RC-driving point impedance function must respectively be

(A) a zero and a pole (B) a zero and a zero

(C) a pole and a zero (D) a pole and a pole

58. An abrupt silicon pn junction has dopant concentrations of $N_a = 2 \times 10^{16}$ cm^{-3} and $N_d = 2 \times 10^{15}$ cm^{-3} at T = 300 K. A reverse-bias voltage of $V_R = 8$ V is applied to the pn junction. What will be the total space charge width in the pn junction?

(A) 2.48×10^{-6} cm (B) 1.34×10^{-6} cm

(C) 1.48×10^{-6} cm (D) 5.25×10^{-6} cm

59. The minimum small signal diffusion resistance of an ideal forward biased silicon pn junction diode at T = 300 K is to be $r_d = 48\ \Omega$. The reverse saturation current is $I_s = 2 \times 10^{-11}$ A. The maximum applied forward-bias voltage that can be applied to meet this specification is

(A) 0.443 V (B) 66.03 V

(C) 17.10 V (D) 0.012 V

60. The applied reverse bias voltage at which the ideal reverse current in a pn junction diode at T = 300 K reaches 90 percent of its reverse saturation current value is

(A) 2.30 mV (B) 3.50 mV

(C) 20.55 m V (D) 59.6 mV

61. In following Fig. 3 .....

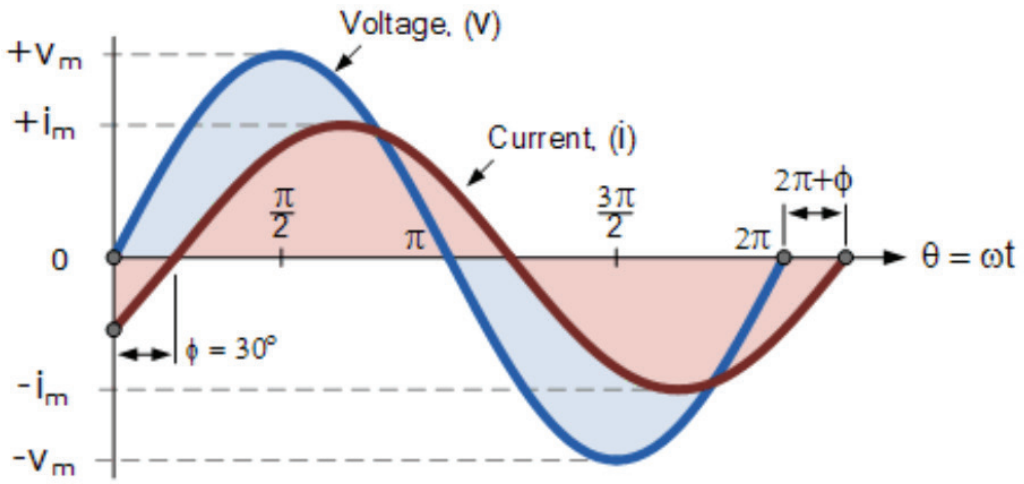

Fig. 3

(A) Voltage lags current by 45°
(B) Voltage lags current by 30°
(C) Current lags voltage by 30°
(D) Voltage leads current by 45°

62. A MOS capacitor made using p type substrate is in the accumulation mode. The dominant charge in the channel is due to the presence of

(A) hole
(B) electrons
(C) positively charged ions
(D) negatively charged ions

63. Consider the following statements S1 and S2 :

S1 : The β of a bipolar transistor reduces if the base width is increased.

S2 : The β of a bipolar transistor increases if the doping concentration in the base is increased.

Which remarks of the following is correct?

(A) S1 is FALSE and S2 is TRUE
(B) Both S1 and S2 are TRUE
(C) Both S1 and S2 are FALSE
(D) S1 is TRUE and S2 is FALSE

64. Two identical FETs, each characterised by the parameters g_m and r_d are connected in parallel. The composite FET is then characterised by the parameters

(A) $\frac{g_m}{2}$ and $2r_d$

(B) $\frac{g_m}{2}$ and $\frac{r_d}{2}$

(C) $2g_m$ and $\frac{r_d}{2}$

(D) $2g_m$ and $2r_d$

65. An npn transistor has a beta cut-off frequency f_β of 1 MHz and common emitter short circuit low frequency current gain β_0 of 200. Its unity gain frequency f_T and the alpha cut off frequency f_α respectively are

(A) 200 MHz, 201 MHz

(B) 200 MHz, 199 MHz

(C) 199 MHz, 200 MHz

(D) 201 MHz, 200 MHz

66. The current gain of the transistor shown in circuit of Fig. 4 is $\beta = 125$. The Q-point values (I_{CQ}, V_{CEQ}) are

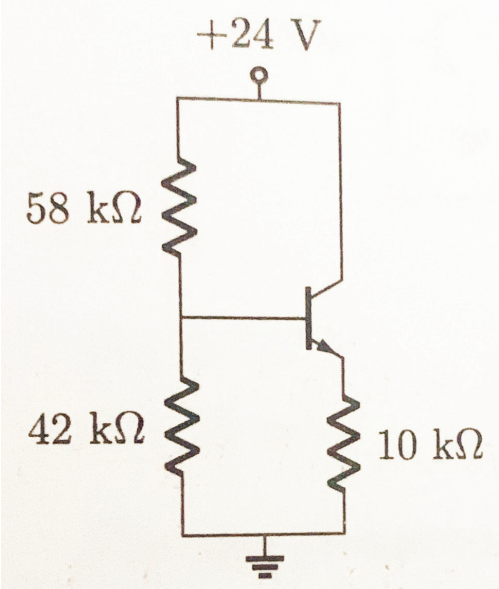

Fig. 4

(A) 0.418 mA and 20.4 V

(B) 0.915 mA and 14.8 V

(C) 0.915 mA and 16.23 V

(D) 0.418 mA and 18.43 mV

67. A voltage follower is built using an op-amp whose open loop gain is A_0, the gain error is

(A) $\frac{A_0}{1 + A_0}$ (B) $\frac{1}{1 + A_0}$

(C) $\frac{1 + A_0}{A_0}$ (D) None of these

68. In the following circuit as shown in Fig. 5, the output is given as

$$V_0 = -10v_1 - 4v_2 + 5v_3 + 2v_4$$

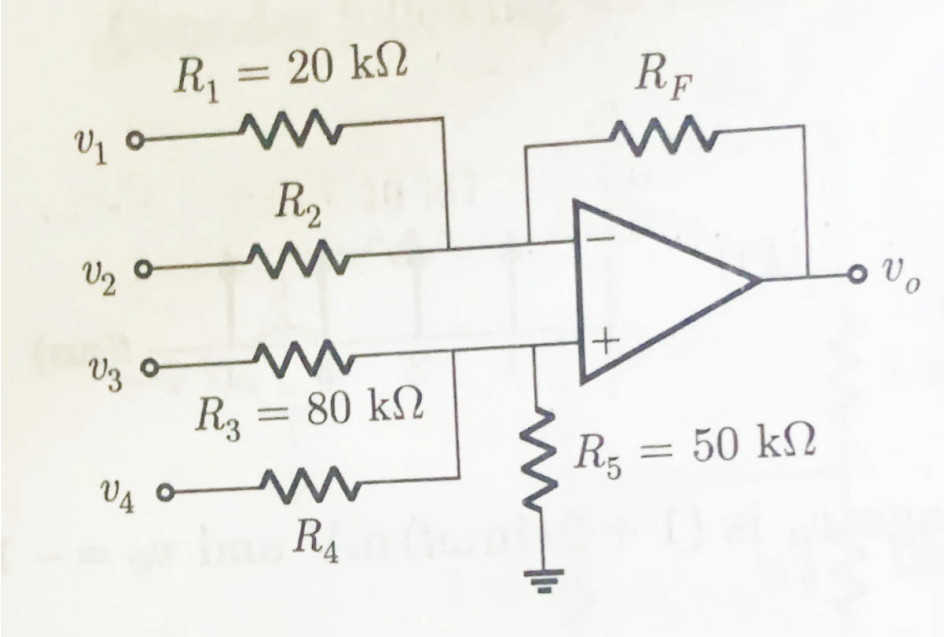

Fig. 5

The resistances R_2, R_4 and R_F respectively are

(A) 50 kΩ, 200 kΩ, 500 kΩ (B) 50 kΩ, 100 kΩ, 80 kΩ

(C) 50 kΩ, 200 kΩ, 200 kΩ (D) 50 kΩ, 80 kΩ, 100 kΩ

69. An op-amp has an open loop gain of 10^5 and an open loop upper cut off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed loop gain of 100, then the new upper cut off frequency is

(A) 100 kHz (B) 90 kHz

(C) 110 kHz (D) 10 kHz

70. The following op-amp circuit as shown in Fig. 6 is an example of

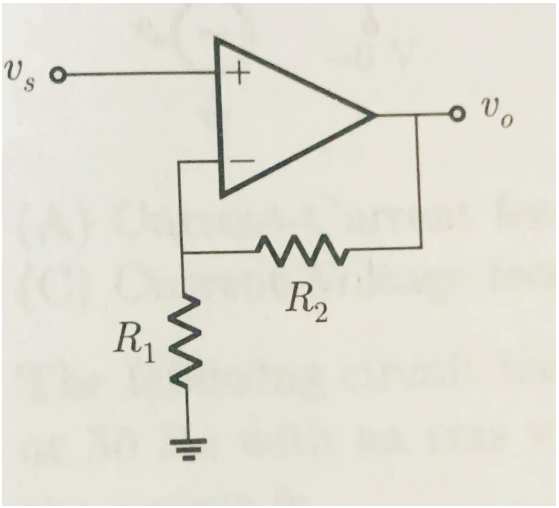

Fig. 6

(A) Series-Shunt feedback amplifier

(B) Series-Series feedback amplifier

(C) Shunt-Shunt feedback amplifier

(D) Shunt-Series feedback amplifier

71. An op-amp having a slew rate of 62.8 V/msec, is connected in a voltage follower configuration. If the maximum amplitude of the input sinusoid is 10 V, then minimum frequency at which slew limited distortion would set in at the output is

(A) 1.0 MHz

(B) 6.28 MHz

(C) 10.0 MHz

(D) 62.8 MHz

72. In the sum of product function f(X, Y, Z) = Σm(2, 3, 4, 5), the prime implicants are

(A) $\overline{X}\overline{Y}$, $X\overline{Y}$

(B) $\overline{X}Y$, $X\overline{Y}$

(C) $XY\overline{Z}$, $\overline{X}YZ$, $X\overline{Y}$

(D) $XY\overline{Z}$, $\overline{X}Y\overline{Z}$, $X\overline{Y}$

73. The Boolean expression

$$Y = \overline{A}\,\overline{B}\,\overline{C}\,D + \overline{A}BC\overline{D} + A\overline{B}\,\overline{C}\,D + AB\overline{C}\,\overline{D}$$

(A) $Y = \overline{A}\,\overline{B}\,\overline{C}D + \overline{A}B\overline{C} + A\overline{C}D$ (B) $Y = \overline{A}\,\overline{B}\,\overline{C}D + BC\overline{D} + A\overline{B}\,\overline{C}D$

(C) $Y = \overline{A}B\overline{C}D + \overline{B}C\overline{D} + A\overline{B}\,\overline{C}D$ (D) $Y = \overline{A}B\overline{C}D + \overline{B}\,\overline{C}D + AB\overline{C}\,\overline{D}$

74. What are the values of x & y in the expression $(235)_x = (565)_{10} = (1065)_y$

(A) 6,14 (B) 16, 8

(C) 8,16 (D) 12, 8

75. Consider the following statements

(i) TTL has high switching speed and good fan out capability.

(ii) ECL has least propagation delay.

(iii) I^2L uses multi collector transistor.

(iv) NMOS has more silicon area.

Which of the statements given above are correct

(A) (i) and (ii) (B) (ii), (iii) and (iv)

(C) (ii) and (iv) (D) (i), (ii) and (iii)

76. Two D flip-flops are connected as a synchronous counter that goes through the following Q_BQ_A sequence as $00 \rightarrow 11 \rightarrow 01 \rightarrow 10 \rightarrow 00 \rightarrow$ .....

(A) $D_A = Q_B$, $D_B = Q_A$

(B) $D_A = \overline{Q}_A$, $D_B = \overline{Q}_B$

(C) $D_A = (Q_A\overline{Q}_B + \overline{Q}_AQ_B)$, $D_B = Q_A$

(D) $D_A = (Q_AQ_B + \overline{Q}_A\overline{Q}_B)$, $D_B = \overline{Q}_B$

77. The open loop transfer function of unity feedback control system is given by :

$$G(s) = \frac{k(s + 0.1)}{s(sT_1 + 1)\ (sT_2 + 1)}$$

For the system to be stable the range of k is

(A) $0 < k < \left(\frac{1}{T_1} + \frac{1}{T_2}\right)$ (B) $k > \left(\frac{1}{T_1} + \frac{1}{T_2}\right)$

(C) $0 < k < T_1T_2$ (D) $k > T_1T_2$

78. The unit step response of a unity feedback system whose open loop transfer is $G(s) = \frac{(2s + 1)}{s^2}$

(A) $2e^{-t} - te^{-t}$ (B) $2e^{-t} + te^{t}$

(C) $1 + e^{-t} + t^2e^{-t}$ (D) $1 - e^{-t} + te^{-t}$

79. The number of roots of the equation lie in right-half s-plane

$s^6 + 2s^5 + 8s^4 + 15s^3 + 20s^2 + 16s + 16 = 0$

(A) 02 (B) 03

(C) 04 (D) None of these

80. The Nyquist plot of a loop transfer function $G(j\omega)H(j\omega)$, of a system encloses the (–1, j0) point. The gain margin of the system is

(A) less than zero (B) zero

(C) greater than zero (D) infinity

81. The z-transform X(z) of a sequence x[n] is given by $X[z] = \frac{0.5}{1 - 2z^{-1}}$. It is given that the region of convergence X(z) includes the unit circle. The value of x[0] is

(A) –0.5 (B) 0

(C) 0.25 (D) 0.5

82. The 4 point DFT (Discrete Fourier Transform) of a discrete time sequence {1, 0, 2, 3} is

(A) [0, –2 + 2j, 2, –2 – 2j]

(B) [2, 2 + 2j, 6, 2 – 2j]

(C) [6, 1 – 3j, 2, 1 + 3j]

(C) [6, –1 + 3j, 0, –1 – 3j]

83. Consider a four-bit D to A converter, the analog value corresponding to digital signals of values 0000 and 0001 are 0 V and 0.0625 respectively. The analog value in volts corresponding to the digital signal 1111 is

(A) 0.9475

(B) 0.95

(C) 0.9375

(D) 1.05

84. In a vectored interrupt

(A) The branch address is assigned to a fixed location in memory

(B) The branch address is obtained from a register in the processor

(C) The interrupting source supplies the branch information to the processor through an interrupt vector

(D) All of these

85. Each cell of a static Random Access Memory Contains

(A) 04 MOS Transistor and 01 Capacitors

(B) 06 MOS Transistors and 02 Capacitors

(C) 06 MOS Transistors

(D) 02 MOS transistors and 02 Capacitors

86. The input autocorrelation of RC filter which is subjected to a white noise of spectral density $\frac{\eta_0}{2}$ is

(A) $\frac{\eta_0}{2}(\delta(\tau))$

(B) $-\frac{\eta_0}{2}(\delta(\tau))$

(C) $\eta_0(\delta(\tau))$

(D) $-\eta_0(\delta(\tau))$

87. As modulation index of an FM signal with sinusoidal modulation is increased from zero to three, power in carrier component will

(A) Increase continuously

(B) Decrease continuously

(C) First increase, attain a maximum and then decrease

(D) First decrease, become zero and then increase

88. A super heterodyne receiver operates in the frequency range of 58 MHz – 68 MHz. The intermediate frequency f_{IF} and local oscillator frequency f_{L0} are chosen such that $f_{IF} \leq f_{L0}$. It is required that the image frequencies fall outside the 58 MHz – 68 MHz band. The minimum required f_{IF} (in MHz) is

(A) 20 (B) 15

(C) 10 (D) 05

89. The output S/N PCM sampling at 8000 samples per second and using 06 bits/word for the transmission is

(A) 24 dB (B) 36 dB

(C) 39 dB (D) 18 dB

90. In a digital communication system employing Frequency Shift Keying (FSK), the 0 and 1 bit are represented by sine waves of 10 kHz and 25 kHz respectively. These waveforms will be orthogonal for a bit interval of

(A) 250 μ sec (B) 200 μ sec

(C) 150 μ sec (D) 50 μ sec

91. Which among the following is used to construct the binary code that satisfies the prefix condition?

(A) Information Rate (B) Noiseless Channel

(C) Channel Coding Theorem (D) Kraft Inequality

92. Which one of the following sets of equations is independent of Maxwell's equations?

(A) Two curl equations

(B) Two divergence equations

(C) Both the curl and divergence equations

(D) Two curl equations combined with the continuity equation

93. The inconsistency of continuity equation for time varying was corrected by Maxwell and the correction applied was

(A) Ampere's Law, $\frac{\partial D}{\partial t}$

(B) Gauss's Law, J

(C) Faraday's Law, $\frac{\partial B}{\partial t}$

(D) Ampere's Law, $\frac{\partial \rho}{\partial t}$

94. The polarization of a wave with electric field vector

$\vec{E} = E_0 e^{j(\omega t - \beta z)} (\vec{a}_x + \vec{a}_y)$ is

(A) Left hand circular

(B) Right hand circular

(C) Linear

(D) Elliptical

95. A parallel plate guide operates in the TEM mode only over the frequency range $0 < f < 3$ GHz. If the dielectric between plates is teflon ($\varepsilon_r = 2.1$), then the maximum allowable plate separation 'b' is

(A) 3.4 cm

(B) 6.8 cm

(C) 4.3 cm

(D) 8.6 cm

96. A(75 – j40) Ω load is connected to a coaxial line of $Z_0 = 75$ Ω at 6 MHz. The load matching on the line can be accomplished by connecting

(A) a short-circuited stub at the load

(B) an inductance at the load

(C) a short-circuited stub at a specific distance from the load

(D) a capacitance at a specific distance from the load

97. In an impedance Smith chart, a clockwise movement along a constant resistance circle gives rise to

(A) no change in reactance value (B) no change in impedance value

(C) decrease in value of reactance (d) increase in value of reactance

98. A set of linear equations is represented by the matrix equation Ax = b. The necessary condition for the existence of solution for this system is

(A) A must be invertible

(B) b must be linearly depended on the columns of A

(C) b must be linearly independent of the columns of A

(D) None of these

99. If a function is continuous at a point, then its first derivative

(A) may or may not exist (B) exits always

(C) will not exist (D) has a unique value

100. Residue of the function $\frac{1 - e^{2z}}{z^4}$ at its pole is

(A) $\frac{2}{3}$ (B) $\frac{4}{3}$

(C) $\frac{-4}{3}$ (D) 1

ROUGH WORK