

Entrance Test for Ph.D. Programme-2018

Time: 120 Minutes

Max Marks: 100

Discipline: Electronics & Comm Engg

Set: A Test ID: 17

Name:

Father Name:

Roll Number: Date:/...../.....

Roll Number in words:

Signature of Candidate:

Signature of Invigilator:

INSTRUCTIONS FOR CANDIDATES

1. Do not open seal before start of Exam.
2. Carefully fill all your details in top portion of this question paper. Don't leave any column blank.
3. Use blue/black ball point pen to fill details on question paper. Write only in capital letters.
4. Carefully fill all your details in top portion of OMR answer sheet. Also put your signatures at bottom portion of OMR.
5. Use only black ball point pen to fill details & darken circles on OMR sheet. Using pencil is strictly prohibited.
6. Carefully fill your Roll No, Test ID, Category, Paper Set and other required details on the OMR sheet.
7. Question paper consists of two sections. Section-I is of Research Methodology and Section-II is Subject specific. Each section contains 50 multiple choice questions. Total 100 questions of one mark each.
8. Maximum marks are 100.
9. Time allowed is 120 minutes.
10. Qualifying marks shall be 50% for General Category and 45% for Reserved Categories.
11. All questions are compulsory. No negative marking for wrong answers.
12. There are four alternative answers for each question out of which only one is correct.
13. You have to darken the circle of right answer on OMR answer sheet.
14. Questions left blank or attempted with two or more options/answers will not be evaluated.
15. Also read carefully the instructions on OMR answer sheet before attempting the questions.
16. Use of calculator is not allowed.
17. Log tables may be provided for calculation work, if required.
18. OMR sheet should not be folded or crushed. Don't put any stray marks on the sheet.
19. Circles on OMR sheet should be darkened completely. Incomplete/half filled circles will not be evaluated.
20. Do not use marker or white fluid on the OMR sheet.
21. The medium of the examination is English only.
22. No extra sheet will be provided for the rough work. Use the space inside the question paper pages for rough work.
23. Carrying mobile phones, electronic gadgets, notes or extra papers in examination hall is strictly prohibited.
24. Indulging in any form of unfair means, canvassing, impersonation or misbehaviour with examination staff will result in disqualification of your candidature.

Section-I
Research Methodology

1. Who authored the book "Methods in Social Research"?
 - A) Wilkinson
 - B) C R Kothari
 - C) Kerlinger
 - D) Goode and Halt
2. Social Science deals with
 - A) Objects
 - B) Human beings
 - C) Living things
 - D) Non-living things
3. "The Romance of Research" is authored by
 - A) Redmen and Mory
 - B) P. V. Young
 - C) Robert C. Meir
 - D) Harold Dazier
4. Which of the following is an example of primary data?
 - A) Book
 - B) Journal
 - C) Newspaper
 - D) Census Report
5. ICSSR stands for
 - A) Indian Council for Survey and Research
 - B) Indian Council for Strategic Research
 - C) Indian Council for Social Science Research
 - D) Inter National Council for Social Science Research

6. JRF stands for
 - A) Junior Research Functions
 - B) Junior Research Fellowship
 - C) Junior Fellowship
 - D) None of the above
7. In the formulation of problem, which of the following we need to give?
 - A) Title
 - B) Index
 - C) Bibliography
 - D) Concepts
8. Analogies are sources of
 - A) Data
 - B) Concept
 - C) Research
 - D) Hypothesis
9. When a hypothesis is stated negatively, it is called
 - A) Relational Hypothesis
 - B) Situational Hypothesis
 - C) Null Hypothesis
 - D) Casual Hypothesis
10. In a survey, there is an enumerator and
 - A) Guide
 - B) Respondent
 - C) Supervisor
 - D) Messenger
11. A short summary of Technical Paper is called
 - A) Article
 - B) Research Abstract

- C) Publication
 - D) Guide
12. Ph.D. stands for
- A) Doctor of Philosophy
 - B) Degree in Philosophy
 - C) Doctor of Psychology
 - D) None of the above
13. Failure to acknowledge the borrowed material; is called (Take and use of others as one's own)
- A) Acknowledgement
 - B) Foot Notes
 - C) Index
 - D) Plagiarism
14. Data related to the Human beings are called
- A) Territorial data
 - B) Organisational data
 - C) Peripheral data
 - D) Demographic data
15. Schedule is filled by which of the following?
- A) Respondent
 - B) Enumerator
 - C) Everybody
 - D) None of the above
16. Questions in which only two alternatives are possible are called
- A) Multiple choice questions
 - B) Dichotomous Questions
 - C) Open ended questions
 - D) Structured questions

17. Assigning numerals or other symbols to the categories or response is called
- A) Editing
 - B) Coding
 - C) Transcription
 - D) Tabulation
18. Tippet table refers to
- A) Table of random digits
 - B) Table used in sampling methods
 - C) Table used in statistical investigations
 - D) All of the above
19. Research and development become the index of development of country. Which of the following reasons are true with regards to the statement?
- A) Because R&D reflect the true economic and social conditions prevailing in a country.
 - B) Because R&D targets the human development.
 - C) Because R&D can improve the standard of living of the people in a country.
 - D) All of the above.
20. The word "Anusandhan" implies
- A) Attaining an aim
 - B) Goal orientation
 - C) Following an aim
 - D) Praying to achieve an aim
21. A Researcher wants to study the relationship of family size to income. He classifies his population into different income slabs and then takes a random sample from each slab in order. Which technique of sampling is he working with?
- A) Cluster sampling
 - B) Random sampling

C) Stratified Random sampling

D) Systematic sampling

For Q. 22-23. The following table gives the sales of batteries manufactured by a company over the years.

Number of different batteries sold (in thousands)

Year	Types of Batteries					
	4AH	7AH	32AH	35AH	55AH	Total
1992	75	144	114	102	108	543
1993	90	126	102	84	126	528
1994	96	114	75	105	135	525
1995	105	90	150	90	75	510
1996	90	75	135	75	90	465
1997	105	60	165	45	120	495
1998	115	85	160	100	145	605

22. What was the approximate percentage increase in the sales of 55AH batteries in 1998 compared to that in 1992?

A) 28%

B) 31%

C) 33%

D) 34%

23. The percentage of 4AH batteries sold to the total number of batteries sold was maximum in the year?

A) 1994

B) 1995

C) 1996

- D) 1997
24. Look the series: 22, 21, 23, 22, 24, 23,
- A) 22
 - B) 24
 - C) 25
 - D) 26
25. Which word does not belong to others?
- A) Dodge
 - B) Flee
 - C) Duck
 - D) Avoid
26. Which of the following is not an essential element of report writing?
- A) Research Methodology
 - B) Reference
 - C) Conclusion
 - D) None of the above
27. Which of the following is non-probability sampling?
- A) Snowball
 - B) Random
 - C) Cluster
 - D) Stratified
28. In group interview, there are
- A) One interviewer and one interviewee
 - B) More than one interviewer and one interviewee
 - C) One interviewer and more than one interviewee
 - D) More than one interviewer and more than one interviewee
29. Uniting various qualitative methods with quantitative methods can be called as
- A) Coalesce

- B) Triangulation
- C) Bipartite
- D) Impassive

30. Books and records are the primary sources of data in:

- A) clinical research
- B) historical research
- C) laboratory research
- D) participatory research

31. The important pre-requisites of a researcher in sciences, social sciences and humanities are

- A) laboratory skills, records, supervisor, topic
- B) Supervisor, topic, critical analysis, patience
- C) archives, supervisor, topic, flexibility in thinking
- D) topic, supervisor, good temperament, pre-conceived notions

32. A college wants to give training in use of Statistical Package for Social Sciences (SPSS) to researchers. For this the college should organize

- A) Lecture
- B) Seminar
- C) Workshop
- D) Conference

33. Which One of the following is not a quality of researcher?

- A) Keenness in enquiry
- B) He must be of alert mind
- C) His assertion to outstrip the evidence
- D) Unison with that of which he is in search

34. Null means?

- A) One
- B) Two

- C) Zero
- D) None of the above

35. The depth of any research can be judged by:

- A) title of the research
- B) duration of the research
- C) objectives of the research
- D) total expenditure on the research

36. Fundamental research reflects the ability to:

- A) Expound new principles
- B) Synthesize new ideals
- C) Evaluate the existing material concerning research
- D) Study the existing literature regarding various topics

37. A ratio represents the relation between

- A) Part and Part
- B) Part and Whole
- C) Whole and Whole
- D) All of the above

38. Circle graphs are used to show:

- A) How one part is related to other parts?
- B) How various sections share in the whole?
- C) How one whole is related to other whole?
- D) How various parts are related to the whole?

39. Field-work based research is classified as:

- A) Historical
- B) Empirical
- C) Biographical
- D) Experimental

40. Statistical measure based upon the entire population is called parameter while measure based upon a sample is known as:
- A) Inference
 - B) Statistics
 - C) Sample parameter
 - D) None of these
41. The importance of the correlation co-efficient lies in the fact that:
- A) It is one of the most valid measure of statistics.
 - B) It is a non-parametric method of statistical analysis.
 - C) There is a linear relationship between the correlated variables.
 - D) It allows one to determine the degree or strength of the association between two variables.
42. Which one of the following is the most comprehensive source of population data?
- A) Census
 - B) National Sample Surveys
 - C) Demographic Health Surveys
 - D) National Family Health Surveys
43. Which correlation co-efficient best explains the relationship between creativity and intelligence?
- A) 0.3
 - B) 0.5
 - C) 0.6
 - D) 1.0
44. Normal Probability Curve should be
- A) Zero skewed
 - B) Positively skewed
 - C) Negatively skewed
 - D) Leptokurtic skewed

45. A doctor studies the relative effectiveness of two drugs of dengue fever. His research would be classified as
- A) Case Study
 - B) Ethnography
 - C) Descriptive Survey
 - D) Experimental Research
46. Newton gave three basic laws of motion. This research is categorized as
- A) Sample Survey
 - B) Applied Research
 - C) Descriptive Research
 - D) Fundamental Research
47. When two or more successive footnotes refer to the same work which one of the following expressions is used?
- A) et.al
 - B) op.cit
 - C) loc.cit
 - D) ibid
48. Nine year olds are taller than seven year olds. This is an example of a reference drawn from
- A) Vertical study
 - B) Time series study
 - C) Experimental study
 - D) Cross-sectional study
49. Which one of the following belongs to the category of good 'research ethics'?
- A) Publishing the same paper in two research journals without telling the editors
 - B) Trimming outliers from a data set without discussing your reasons in a research paper

C) Conducting a review of the literature that acknowledges the contributions of other people in the relevant field or relevant prior work

D) Including a colleague as an author on a research paper in return for a favor even though the colleague did not make a serious contribution to the paper

50. Which of the following are the basic rules of APA style of referencing format?

A) Alphabetically index reference list

B) Invert authors' names (last name first)

C) Italicize titles of longer works such as books and journals

D) All of the above

Section-II
Electronics & Communication Engineering

51. The rank of $(m \times n)$ matrix (where $m < n$) cannot be more than

- (a) m
- (b) n
- (c) mn
- (d) none

52. The Taylor Series expansion of $3 \sin x + 2 \cos x$ is

- (a) $2 + 3x - x^2 - \frac{x^3}{2} + \dots$
- (b) $2 - 3x + x^2 - \frac{x^3}{2} + \dots$
- (c) $2 + 3x + x^2 + \frac{x^3}{2} + \dots$
- (d) $2 - 3x - x^2 + \frac{x^3}{2} + \dots$

53. Given that $A = \begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, the value of A^3 is

- (a) $15A + 12I$
- (b) $19A + 30I$
- (c) $17A + 15I$
- (d) $17A + 21I$

54. The equation $\sin(z) = 10$ has

- (a) No real or complex solution
- (b) Exactly two distinct complex solutions
- (c) A unique solution
- (d) An infinite number of complex solution

55. A fair dice is rolled twice. The probability that an odd number will follow an even number is

- (a) $\frac{1}{2}$
- (b) $\frac{1}{6}$
- (c) $\frac{1}{3}$
- (d) $\frac{1}{4}$

56. The equation $x^3 - x^2 + 4x - 4 = 0$ is to be solved using the Newton Raphson Method. If $x = 2$ is taken as initial approximation of the solution, then the next approximation using this method will be

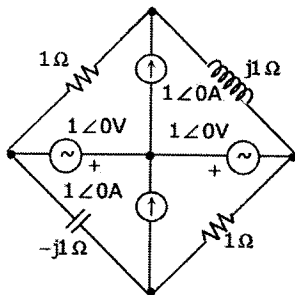
- (a) $\frac{2}{3}$

- (b) $\frac{4}{3}$
- (c) 1
- (d) $\frac{3}{2}$

57. A dc supply of 35 Volt is connected across 600Ω resistance in series with an unknown resistance. The voltmeter having a resistance of $1.2\text{ K}\Omega$ is connected across 600Ω resistance which reads 5 Volt. Then the unknown resistance should be

- (a) $50\ \Omega$
- (b) $1.7\ \Omega$
- (c) $7.2\ \Omega$
- (d) $2.4\ \text{K}\Omega$

58. In the circuit shown below, the current through the inductor is



- (a) $\frac{2}{1+j}\text{ A}$
- (b) $\frac{-1}{1+j}\text{ A}$
- (c) $\frac{1}{1+j}\text{ A}$
- (d) 0 A

59. A network N' is dual of the network N if

- (a) Both of them have same mesh equations
- (b) Both of them have the same load equations
- (c) Mesh equations of one are the load equations of the other
- (d) KCL and KVL equations are same

60. A system is defined by its impulse response $h(n)=2^n u(n-2)$. The system is

- (a) stable and causal
- (b) causal but not stable
- (c) stable but not causal
- (d) unstable and non-causal

61. if $x[n]=(1/3)^{|n|}-(1/2)^n u[n]$, then the region of convergence of its Z-transform in the Z-plane will be

- (a) $\frac{1}{3} < |Z| < 3$

(b) $\frac{1}{3} < |Z| < \frac{1}{2}$

(c) $\frac{1}{2} < |Z| < 3$

(d) $\frac{1}{3} < |Z|$

62. The Trigonometric Fourier Series of an even function does not have the

(a) dc term

(b) cosine terms

(c) sine terms

(d) odd harmonic terms

63. As the forward current through a silicon diode increases, the internal resistance is

(a) increases

(b) decreases

(c) remains same

(d) increases exponentially

64. Which resistance plays a significant role in stabilization of Q-point for self-biasing circuit of BJT?

(a) Emitter resistance

(b) Collector resistance

(c) Source resistance

(d) Drain resistance

65. Calculate the recombination rate if the excess carrier concentration is 10^{14}cm^{-3} and the carrier lifetime is 1 μseconds.

(a) 10^8

(b) 10^{10}

(c) 10^{20}

(d) 10^{14}

66. Zener diodes are also known as

(a) Voltage regulators

(b) Forward bias diode

(c) Breakdown diode

(d) None of the mentioned

67. What is the ratio of $\frac{I_C}{I_B}$?

(a) β_{DC}

(b) h_{FE}

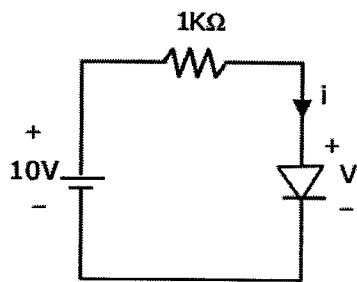
(c) α_{DC}

(d) either β_{DC} or h_{FE} but not α_{DC}

68. The drift velocity of electrons in silicon

- (a) is proportional to the electric field for all values of electric field
 - (b) is independent of the electric field
 - (c) increases at low values of electric field and decreases at high values of electric field exhibiting negative differential resistance
 - (d) increases linearly with electric field and gradually saturates at higher values of electric field
69. Under low level injection assumption, the injected minority carrier current for an extrinsic semiconductor is essentially the
- (a) Diffusion current
 - (b) Drift current
 - (c) Recombination current
 - (d) Induced current
70. The i-v characteristics of the diode in the circuit given below are

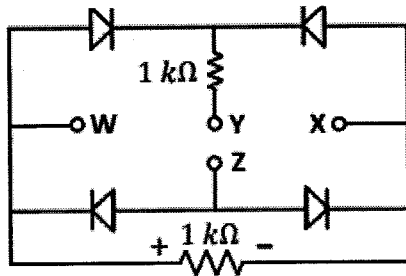
$$i = \begin{cases} \frac{v-0.7}{500} A, v \geq 0.7V \\ 0A, v < 0.7V \end{cases}$$



The current (i) in the above circuit is

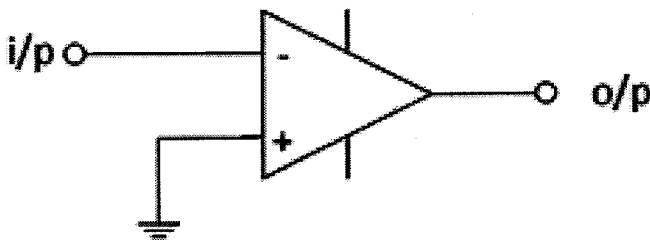
- (a) 10mA
 - (b) 9.3mA
 - (c) 6.67mA
 - (d) 6.2mA
71. A cascade amplifier stage is equivalent to
- (a) A common emitter stage followed by a common base stage
 - (b) A common base stage followed by an emitter follower
 - (c) An emitter follower stage followed by a common base stage
 - (d) A common base stage followed by a common emitter stage

72. A voltage $1000 \sin(\omega t)$ volts is applied across YZ. Assuming ideal diodes, the voltage measured across WX in volts, is



- (a) $\sin(\omega t)$
- (b) $\sin(\omega t - |\sin(\omega t)|)/2$
- (c) $\sin(\omega t + |\sin(\omega t)|)/2$
- (d) 0 for all t

73. If the input to the circuit of following figure is a sine wave, the output will be



- (a) A half wave rectified sine wave
- (b) A full-wave rectified sine wave
- (c) A triangular wave
- (d) A square wave

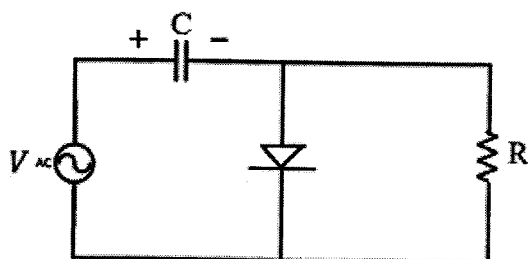
74. In CMOS technology, shallow P-well or N-well regions can be formed using

- (a) Low pressure chemical vapour deposition
- (b) Low energy sputtering
- (c) Low temperature dry oxidation
- (d) Low energy ion – implantation

75. A MOS Capacitor made using P-Type substrate is in accumulation mode. The dominant charge in the channel is due to the presence of

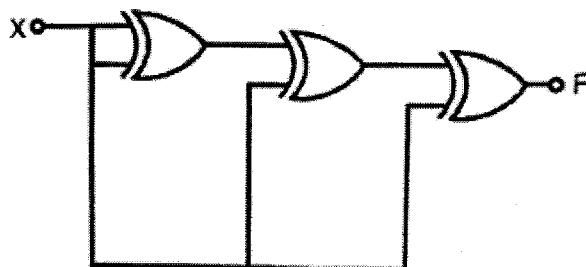
- (a) Holes
- (b) Electrons
- (c) Positively charged ions
- (d) Negatively charged ions

76. If the following circuit has to function as a clamping circuit, then which one of the following conditions should be satisfied for the sinusoidal signal of period T ?



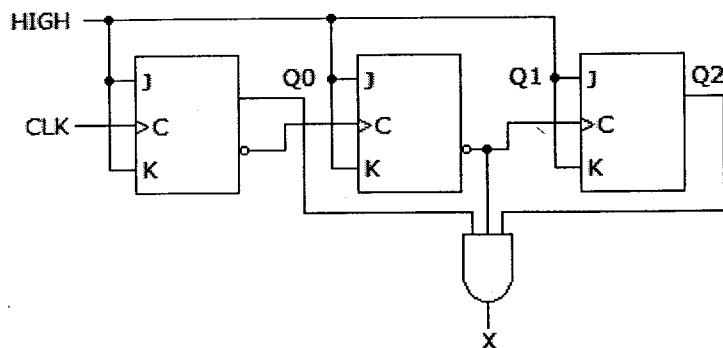
- (a) $RC \ll T$
- (b) $RC = 0.35 T$
- (c) $RC = T$
- (d) $RC \gg T$

77. For the circuit given below, the output F is given by



- (a) $F=0$
 - (b) $F=1$
 - (c) $F=X$
 - (d) $F=\text{Not of } X$
78. Which of the following is an important feature of the Sum-of-Products (SOP) form of expressions?
- (a) All logic circuits are reduced to nothing more than simple AND and OR operations.
 - (b) The delay times are greatly reduced over other forms.
 - (c) No signal must pass through more than two gates, not including inverters.
 - (d) The maximum number of gates that any signal must pass through is reduced by a factor of two.
79. How many flip-flops are required to make a MOD-32 binary counter?
- (a) 6
 - (b) 5
 - (c) 4
 - (d) 3

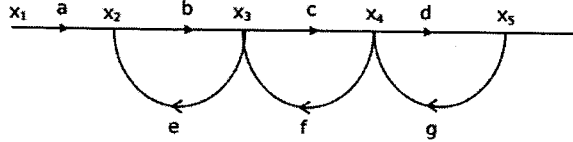
80. What decimal value is required to produce an output at X?



- (a) 2
 - (b) 3
 - (c) 4
 - (d) 5
81. The resolution of an N bit DAC with a maximum input of 5 V is 5 mV. The value of N is
- (a) 9
 - (b) 10
 - (c) 11
 - (d) 12
82. In 8085 microprocessor, the value of the most significant bit of the result following the execution of any arithmetic or Boolean instruction is stored in
- (a) the auxiliary carry status flag
 - (b) sign status flag
 - (c) zero status flag
 - (d) The carry status flag
83. The open-loop DC gain of a unity negative feedback system with closed-loop transfer function $\frac{s+4}{s^2+7s+13}$ is
- (a) 4/13
 - (b) 4/9
 - (c) 4
 - (d) 13
84. A system with transfer function $G(s) = \frac{(s^2+9)(s+2)}{(s+1)(s+3)(s+4)}$ is excited by $\sin(\omega t)$. The Steady-State output of the system is zero at
- (a) 1 rad/s
 - (b) 2 rad/s
 - (c) 3 rad/s

(d) 4 rad/s

85. Consider the signal flow graph shown in Figure. The gain $\frac{x_5}{x_1}$ is



- (a) $\frac{1-(be+cf+dg)}{abc}$
- (b) $\frac{bedg}{1-(be+cf+dg)}$
- (c) $\frac{abcd}{1-(be+cf+dg)+bedg}$
- (d) $\frac{1-(be+cf+dg)+bedg}{abcd}$

86. For the equation, $S^3-4s^2+s+6=0$, the number of roots in the left half of s-plane will be

- (a) Zero
- (b) One
- (c) two
- (d) three

87. The transfer function of a system is given as $\frac{100}{s^2+20s+100}$. The system is

- (a) an overdamped system
- (b) an underdamped system
- (c) a critically damped system
- (d) an unstable system

88. For a system with the transfer function $H(s) = \frac{3(s-2)}{4s^2-2s+1}$, the matrix A in the state space from $x=$

$Ax+Bu$ is equal to

- (a) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -1 & 2 & -4 \end{bmatrix}$
- (b) $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & 2 & -4 \end{bmatrix}$
- (c) $\begin{bmatrix} 0 & 1 & 0 \\ 3 & -2 & 1 \\ 1 & -2 & 4 \end{bmatrix}$
- (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ -1 & 2 & -4 \end{bmatrix}$

89. The velocity of sound waves in air

- (a) Independent at all temperatures
- (b) Varies directly as temperature

- (c) Varies inversely as absolute temperature
 - (d) Varies directly as square root of absolute temperature
90. A 1000 kHz carrier is simultaneously modulated with 300 Hz, 800 Hz and 2 kHz audio sine waves. Which of the following frequency is least likely to be present in the output?
- (a) 1002 kHz
 - (b) 1000 kHz
 - (c) 999.2 kHz
 - (d) 998.0 kHz
91. If transmission bandwidth is doubled in FM, then SNR is
- (a) Twice
 - (b) halved
 - (c) Four times
 - (d) Decreases four times
92. In FM system, when the AF is 500 Hz and the AF voltage is 2.4 V, the deviation is 4.8 kHz. If the AF voltage is now increased to 7.2 V, the new deviation will be
- (a) 4.8KHz
 - (b) 9.6KHz
 - (c) 14.4KHz
 - (d) 28.8KHz
93. Which of the following is not a Digital-to-Analog conversion?
- (a) ASK
 - (b) PSK
 - (c) AM
 - (d) FSK
94. In a Super-heterodyne receiver, the IF is 455 kHz. If it is tuned to 1200 kHz, the image frequency will be
- (a) 1655KHz
 - (b) 2110KHz
 - (c) 745KHz
 - (d) 910KHz
95. The phase velocity of waves propagating in a hollow metal waveguide is
- (a) greater than the velocity of light in free space.
 - (b) less than the velocity of light in free space.
 - (c) equal to the velocity of light in free space.
 - (d) equal to the group velocity.
96. The dominant mode in a rectangular waveguide is TE₁₀, because this mode has
- (a) no attenuation

- (b) no cut-off
 - (c) no magnetic field component
 - (d) the highest cut-off wavelength
97. The electric field component of a time harmonic plane EM wave traveling in a nonmagnetic lossless dielectric medium has an amplitude of 1 V/m. If the relative permittivity of the medium is 4, the magnitude of the time-average power density vector (in W/m²) is
- (a) $1/30\pi$
 - (b) $1/60\pi$
 - (c) $1/120\pi$
 - (d) $1/240\pi$
98. An air-filled rectangular waveguide has inner dimensions of 3cm×2cm. The wave impedance of the TE₂₀ mode of propagation in the waveguide at a frequency of 30 GHz is (Assume free space impedance $\eta_0 = 377 \Omega$)
- (a) 308 Ω
 - (b) 355 Ω
 - (c) 400 Ω
 - (d) 461 Ω
99. The Maxwell equation $\nabla \times \mathbf{H} = \mathbf{J} + \frac{\partial \mathbf{D}}{\partial t}$ is based on
- (a) Ampere's law
 - (b) Gauss' law
 - (c) Faraday's law
 - (d) Coulomb's law
100. A medium wave radio transmitter operating at a wavelength of 492 m has a tower antenna of height 124m. What is the radiation resistance of the antenna?
- (a) 25 Ω
 - (b) 36.5 Ω
 - (c) 50 Ω
 - (d) 73 Ω

