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M.Phil./Ph.D. Entrance Examination, October - 2021 ENGINEERINGAND TECHNOLOGY

Electronics Engineering (For M.E., M. Tech. Students)

Day and Date : Tuesday, 26/10/2021 Time : 04.00 p.m. to 06.00 p.m. **Total Marks : 100**

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) Research is
 - (A) Searching again and again
 - (B) Finding solution to any problem
 - (C) Working in a scientific way to search for truth of any problem
 - (D) None of the above
- 2) Which of the following is the first step in starting the research process?
 - (A) Searching sources of information to locate problem.
 - (B) Survey of related literature
 - (C) Identification of problem
 - (D) Searching for solutions to the problem
- 3) A common test in research demands much priority on
 - (A) Reliability (B) Useability
 - (C) Objectivity (D) All of the above

- 4) Action research means
 - (A) A longitudinal research
 - (B) An applied research
 - (C) A research initiated to solve an immediate problem
 - (D) A research with socioeconomic objective
- 5) A reasoning where we start with certain particular statements and conclude with a universal statement is called
 - (A) Deductive Reasoning (B) Inductive Reasoning
 - (C) Abnormal Reasoning (D) Transcendental Reasoning
- 6) Which of the following variables cannot be expressed in quantitative terms?
 - (A) Socio-economic Status (B) Marital Status
 - (C) Numerical Aptitude (D) Professional Attitude
- 7) The essential qualities of a researcher are
 - (A) Spirit of free enquiry
 - (B) Reliance on observation and evidence
 - (C) Systematization or theorizing of knowledge
 - (D) All the above
- 8) In the process of conducting research 'Formulation of Hypothesis" is followed by
 - (A) Statement of Objectives (B) Analysis of Data
 - (C) Selection of Research Tools (D) Collection of Data
- 9) Questionnaire is a:
 - (A) Research method (B) Measurement technique
 - (C) Tool for data collection (D) Data analysis technique
- 10) Which of the following is not covered under Intellectual Property Rights?
 - (A) Copyrights (B) Patents
 - (C) Trade Marks (D) Thesaurus

11)	Which of the following is not an essential element of report writing?				
	(A)	Research Methodology	(B)	Reference	
	(C)	Conclusion	(D)	None of these	
12)	Test	ing hypothesis is a			
12)	(A)	Informatical statistics	(\mathbf{D})	Deceminting statistics	
	(A)	Interential statistics	(D)	Descriptive statistics	
	(C)	Data preparation	(D)	Data analysis	
13)	Scie	entific method is committed to			
	(A)	Objectivity	(B)	Ethics	
	(C)	Proposition	(D)	Neutrality	
14)	Proł	pability sampling is otherwise called			
	(A)	Multiple choice	(B)	Uni-variate Analysis	
	(C)	Random Sampling	(D)	Bi-variate Analysis	
15)	Sch	edule is used as a			
	(A)	Ouestionnaire	(B)	Tool	
	(C)	Method	(D)	Technique	
				1	
16)	Ane	example of non-personal method of	Data	collection is	
	(A)	Interview	(B)	Group Interview	
	(C)	Schedule	(D)	Telephone Interview	
17)	Anl	Interview in which interviewer encour	age t	he respondent to talk freely about	
	a giv	ven topic is			
	(A)	Focused Interview	(B)	Structural Interview	
	(C)	Un Structured Interview	(D)	Clinical Interview	
18)	The	original source from which research	er co	llects information is	
	(A)	Primary Source	(B)	Secondary Source	
	(\mathbf{C})	Both primary and Secondary	(D)	None of these	
	(-)		(_)		

19) _____ is the raw materials for Analysis (A) Variables (B) Problem (D) Sample (C) Data 20) The concrete observable events which represent the abstract concepts or constructs are called (A) Data (B) Sample (D) Proposition (C) Variable 21) The main objective of ______ study's to acquire knowledge (A) Exploratory (B) Descriptive (C) Diagnostic (D) Descriptive and Diagnostic 22) All surveys are essentially _____ (B) Explanatory (A) Narrative (C) Interdisciplinary (D) Communal 23) A Hypothesis must be _____ (B) Specific (A) Diffuse (C) Slow (D) Speedy 24) ______ is a motivation for research in students (A) Research degree (B) Research Academy (C) Research Labs (D) Research Problems **25**) Objectives in problem formulation means (B) Methods (A) Questions to be answered (C) Techniques (D) Methodology

SUBJECT SPECIFIC

- 26) Three fair cubical dice are thrown simultaneously. The probability that all three dice have the same number of dots on the faces showing up is (up to third decimal place) _____
 - (A) 0.027 to 0.028 (B) 0.035 to 0.045
 - (C) 0.060 to 0.652 (D) 0.847 to 0.954
- **27**) Consider the following statements for continuous-time linear time invariant (LTI) systems. I. There is no bounded input bounded output (BIBO) stable system with a pole in the right half of the complex plane. II. There is non causal and BIBO stable system with a pole in the right half of the complex plane. Which one among the following is correct?
 - (A) Both I and II are true (B) Both I and II are not true
 - (C) Only I is true (D) Only II is true
- **28)** Which one of the following statements about differential pulse code modulation (DPCM) is true?
 - (A) The sum of message signal sample with its prediction is quantized
 - (B) The message signal sample is directly quantized and its prediction is not used
 - (C) The difference of message signal sample and a random signal is quantized
 - (D) The difference of message signal sample with its predictions is quantized
- 29) The following FIVE instructions were executed on an 8085 microprocessor. MVIA,33H

MVI B, 78H ADD B CMA

ANI 32H

The Accumulator value immediately after the execution of the fifth instruction is

(A)	00H	(B)	10H
$\langle \mathbf{a} \rangle$	4477		

(C) 11H (D) 32H

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- **30**) The clock frequency of an 8085 microprocessor is 5 MHz. If the time required to execute an instruction is 1.4µs then the number of T-states needed for executing the instruction is
 - (A) 1 (B) 6
 - (C) 7 (D) 8
- 31) The Miller effect in the context of a Common Emitter amplifier explains
 - (A) an increase in the low-frequency cutoff frequency
 - (B) an increase in the high-frequency cutoff frequency
 - (C) a decrease in the low-frequency cutoff frequency
 - (D) a decrease in the high-frequency cutoff frequency

32) In a DRAM,

- (A) periodic refreshing is not required
- (B) information is stored in a capacitor
- (C) information is stored in a latch
- (D) both read and write operations can be performed simultaneously
- **33**) A connection is made consisting of resistance A in series with a parallel combination of resistances B and C. Three resistors of value 10Ω , 5Ω , 2Ω are provided. Consider all possible permutations of the given resistors into the positions A, B, C and identify the configurations with maximum possible overall resistance and also the ones with minimum possible overall resistance. The ratio of maximum to minimum values of the resistances (up to second decimal place) is _____

(A)	2.12 to 2.16	(B)	4.15 to 5.16
(<i>/</i>	_	(=)	

(C) 6.89 to 7.85 (D) 3.12 to 4.15

- **34**) An npn bipolar junction transistor (BJT) is operating in the active region. If the reverse bias across the base collector junction is increased, then
 - (A) the effective base width increases and common emitter current gain increases
 - (B) the effective base width increases and common emitter current gain decreases
 - (C) the effective base width decreases and common emitter current gain increases
 - (D) the effective base width decreases and common emitter current gain decreases
- **35)** A two wire transmission line terminates in a television set. The VSWR measured on the line is 5.8. The percentage of power that is reflected from the television set is _____

(A)	40 to 50	(B)	48 to 51
(C)	38 to 39	(D)	56 to 60

- **36**) Which of the following statements is incorrect?
 - (A) Lead compensator is used to reduce the settling time.
 - (B) Lag compensator is used to reduce the steady state error.
 - (C) Lead compensator may increase the order of a system.
 - (D) Lag compensator always stabilizes an unstable system
- **37**) A sinusoidal message signal is converted to a PCM signal using a uniform quantizer. The required signal-to-quantization noise ratio (SQNR) at the output of the quantizer is 40dB. The minimum number of bits per sample needed to achieve the desired SQNR is _____
 - (A) 5 (B) 4
 - (C) 7 (D) 3
- **38)** The smaller angle (in degrees) between the planes x + y + z = 1 and 2x y + 2z = 0 is _____
 - (A) 50 to 52 (B) 51 to 52
 - (C) 54 to 55 (D) 55 to 56

39) The un-modulated carrier power in an AM transmitter is 5kW. This carrier is modulated by a sinusoidal modulating signal. The maximum percentage of modulation is 50%. If it is reduced to 40%, then the maximum un-modulated carrier power (in kW) that can be used without overloading the transmitter is_____

(A) 4.19 to 4.20	(B)	3.20 to 3.25
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- (C) 5.19 to 5.23 (D) 6.25 to 6.30
- **40)** Passengers try repeatedly to get a seat reservation in any train running between two stations until they are successful. If there is 40% chance of getting reservation in any attempt by a passenger, then the average number of attempts that passengers need to make to get a seat reserved is _____

(A)	3.4 to 3.5	(B)	2.4 to 2.6
(C)	3.1 to 3.3	(D)	6.5 to 6.7

- **41**) Which one of the following is a property of the solutions to the Laplace equation: $\nabla^2 f = 0$?
 - (A) The solutions have neither maxima nor minima anywhere except at the boundaries.
 - (B) The solutions are not separable in the coordinates.
 - (C) The solutions are not continuous.
 - (D) The solutions are not dependent on the boundary conditions.
- **42)** A continuous-time sinusoid of frequency 33 Hz is multiplied with a periodic Dirac impulse train of frequency 46 Hz. The resulting signal is passed through an ideal analog low-pass filter with a cutoff frequency of 23 Hz. The fundamental frequency (in Hz) of the output is _____
 - (A) 20 (B) 25
 - (C) 36 (D) 13

43) Consider the following statements for a metal oxide semiconductor field effect transistor (MOSFET):

P: As channel length reduces, OFF-state current increases.

Q:As channel length reduces, output resistance increases.

R: As channel length reduces, threshold voltage remains constant.

S: As channel length reduces, ON current increases.

Which of the above statements are INCORRECT?

(A) P and Q	(B)	P and S
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- (C) Q and R (D) R and S
- **44**) Consider binary data transmission at a rate of 56 kbps using baseband binary pulse amplitude modulation (PAM) that is designed to have a raised-cosine spectrum. The transmission bandwidth (in kHz) required for a roll-off factor of 0.25 is _____

- (C) 70 (D) 17
- 45) Two lossless X-band horn antennas are separated by a distance of 200λ. The amplitude reflection coefficients at the terminals of the transmitting and receiving antennas are 0.15 and 0.18, respectively. The maximum directivities of the transmitting and receiving antennas (over the isotropic antenna are 18 dB and 22 dB, respectively. Assuming that the input power in the lossless transmission line connected to the antenna is 2 W and that the antennas are perfectly aligned and polarization matched, the power (in mW) delivered to the load at the receiver is _____
 - (A) 5 (B) 3
 - (C) 2 (D) 1

- **46)** Which one of the following statements is correct about an ac-coupled common-emitter amplifier operating in the mid-band region?
 - (A) The device parasitic capacitances behave like open circuits, whereas coupling and by pass capacitances behave like short circuits.
 - (B) The device parasitic capacitances, coupling capacitances and bypass capacitances behave like open circuits.
 - (C) The device parasitic capacitances, coupling capacitances and bypass capacitances behave like short circuits.
 - (D) The device parasitic capacitances behave like short circuits, whereas coupling and bypass capacitances behave like open circuits.
- 47) A speech signal is sampled at 8 kHz and encoded into PCM format using 8 bits/sample. The PCM data is transmitted through a baseband channel via 4-level PAM. The minimum bandwidth (in kHz) required for transmission is

(A) 15 (B) 16 (C) 17 (D) 18

48) The minimum number of 2-input NAND gates required to implement a 2-input XOR gate is

(A) 4 (B) 5 (C) 6 (D) 7

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Rough Work

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