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ENTRANCE EXAMINATION – JULY 2016

QUESTION PAPER

PROGRAMME : Ph. D

ELECTRONICS AND INSTRUMENTATION ENGINEERING / BIO-MEDICAL ENGINEERING

Time : 2 hours **Marks: 100**

INSTRUCTION TO THE CANDIDATES

1. Use only Pencil to indicate your answers. Use Ball-Point only for writing Name, Register Number and Signature.
2. Darken the square completely. Mark your answers like this 1 **2** 3 4
3. Part A is common to all.

Name of the Student: ..... Programme Applied:	Register Number Exam Centre Seal
Signature of the Student	Signature of the Invigilator

NIUEE 2016

Part A

1. The development of a solid foundation of reliable knowledge typically is built from which type of research?
   a. basic research b. action research
   c. evaluation research d. orientational research

2. The idea that when selecting between two different theories with equal explanatory value, one should select the theory that is the most simple, concise, and succinct is known as _____.
   a. criterion of falsifiability b. critical theory
   c. guide of simplicity d. rule of parsimony

3. Research that is done to examine the findings of someone else using the "same variables but different people" is which of the following?
   a. exploration b. Hypothesis c. Replication d. empiricism

4. A researcher designs an experiment to test how variables interact to influence how well children learn spelling words. In this case, the main purpose of the study was:
   a. Explanation b. Description c. Influence d. Prediction

5. What is the key defining characteristic of experimental research?
   a. extraneous variables are never present
   b. a positive correlation usually exists
   c. a negative correlation usually exists
   d. manipulation of the independent variable

6. Which of the following includes examples of quantitative variables?
   a. age, temperature, income, height
   b. grade point average, anxiety level, reading performance
   c. gender, religion, ethnic group
   d. both a and b

7. One step that is not included in planning a research study is:
   a. Identifying a researchable problem b. A review of current research
   c. Statement of the research question d. Developing a research plan

8. Sources of researchable problems can include:
   a. Researchers' own experiences as educators
   b. Practical issues that require solutions
   c. Theory and past research
   d. All of the above

9. The feasibility of a research study should be considered in light of:
   a. Cost and time required to conduct the study
   b. Skills required of the researcher
   c. Potential ethical concerns
   d. All of the above

10. A formal statement of the research question or "purpose of research study" generally _____.
    a. Is made prior to the literature review b. Is made after the literature review
    c. Will help guide the research process d. b and c

11. Which term refers to publishing several articles from the data collected in one large study?
    a. Duplicate publication b. Partial publication
    c. Triplicate publication d. None of these

12. Which of the following is a right of each participant according to the AERA?
    a. Deception b. Utilitarianism
    c. Freedom to withdraw d. Participants have no rights

13. Which of the following is a type of criterion–related validity evidence?
    a. Concurrent evidence b. Predictive evidence
    c. Internal consistency d. Both a and b are correct answers

14. Which of the following is not a type of reliability?
    a. Test-retest b. Split-half c. Content d. Internal consistency

15. Which of the following types of reliability refers to the consistency of test scores over time?
    a. Equivalent forms reliability b. Split-half reliability
    c. Test-retest reliability d. Inter-scorer reliability

16. Which type of reliability refers to the consistency of a group of individuals' scores on two equivalent forms of a test designed to measure the same characteristic?
    a. Split-half b. Test-retest c. Split-forms d. Equivalent forms

17. _____ refers to how well the particular sample of behaviors used to measure a characteristic reflects the entire domain of behaviors that constitutes that characteristic.
    a. Construct validity evidence b. Criterion-related validity evidence
    c. Content validity evidence d. Face validity evidence

18. Which of these is not a method of data collection.
    a. Questionnaires b. Interviews c. Experiments d. Observations

19. Another name for a Likert Scale is a(n):
    a. Interview protocol b. Event sampling
    c. Summated rating scale d. Ranking

20. A question during an interview such as "Why do you feel that way?" is known as a:
    a. Probe b. Filter question c. Response d. Pilot

21. A census taker often collects data through which of the following?
    a. Standardized tests b. Interviews
    c. Secondary data d. Observations

22. In which of the following nonrandom sampling techniques does the researcher ask the research participants to identify other potential research participants?
a. Snowball b. Convenience c. Purposive d. Quota

23. Which of the following is the most efficient random sampling technique?
a. Simple random sampling b. Proportional stratified sampling
c. Cluster random sampling d. Systematic sampling

24. Which of the following would usually require the smallest sample size because of its efficiency?
a. One stage cluster sampling b. Simple random sampling
c. Two stage cluster sampling d. Quota sampling

25. _____ is a set of elements taken from a larger population according to certain rules.
a. Sample b. Population c. Statistic d. Element

Part B

26. Power gain in decibels is equal to voltage gain in decibels only when
a. Input impedance is equal to output impedance b. Output impedance is zero
c. Never d. Input impedance is zero

27. Isolation amplifiers are also called as
a. DC amplifier b. Output amplifier c. Inverting amplifier d. Iso-amps

28. Fidelity represents
S1: Reproduction of signal
S2: Reproduction of phase relation
a. S1 and S2 are true b. S1 and S2 are false
c. S1 false and S2 true d. S1 true and S2 false

29. The amplifier which has no drift is called as
a. Differential amplifier b. DC amplifier
c. Single ended amplifier d. Chopper amplifier

30. When the input of differential amplifier V1 = 0, then the differential amplifier is said to be operated in
a. Common mode b. Differential mode c. Non inverting mode d. Inverting mode

31. The amplifier gain varies with frequency. This happens mainly due to
a. Miller effect b. Presence of external and internal capacitance
c. Logarithmic increase in its output d. Inter stage transformer

32. Storage oscilloscope operates on the principle of
a. Primary emission b. Deflection
c. Secondary emission d. Diffusion

33. To reduce common mode interference during recording of bio signals one can use_____
    a. Buffer amplifier
    b. Differential amplifier
    c. Single ended amplifier
    d. Chopper amplifier

34. CMRR is more in_____
    a. Single ended amplifier
    b. Differential amplifier
    c. Inverting operational amplifier
    d. Chopper amplifier

35. _____ amplifier is used to drive the recorder.
    a. Power amplifier
    b. Pre amplifier
    c. Operational amplifier
    d. Differential amplifier

36. A chopper amplifier
    a. Converts AC signal from low frequency to high frequency
    b. Converts DC signal from low frequency to high frequency
    c. Converts AC signal from low frequency to DC high frequency
    d. Converts DC signal from low frequency to high frequency

37. Power amplifier is provided with
    S1: Cross over distortion compensation
    S2: Offset control
    a. S1 is true & S2 is false
    b. S2 is true & S1 is false
    c. Both S1 & S2 are true
    d. Both S1 & S2 are false

38. Feedback in an amplifier always helps in
    a. Increasing its input impedance
    b. Increasing its gain
    c. Controlling its output
    d. Stabilizes its gain

39. Pre amplifier isolation in ECG circuit is to
    a. Increase input impedance
    b. Decrease input impedance
    c. Increase output impedance
    d. Decrease output impedance

40. The negative feedback in an amplifier
    a. Reduces voltage gain
    b. Increases the voltage gain
    c. Increases the gain band width product
    d. Reduces the input impedances

41. A ————— is usually a display device used to produce a paper record of analog wave form.
    a. Graphic pen recorder
    b. Electron microscope
    c. X-Y recorder
    d. Oscilloscope

42. Function of microscope is
    S1: To magnify object, under observation
    S2: To resolve the object
    a. S1 is true & S2 is false
    b. S2 is true & S1 is false
    c. Both S1 & S2 are true
    d. Both S1 & S2 are false

43. Duration of rotation of pen in the PMMC system depends upon _____
a. Phase angle b. Frequency c. Magnitude d. Direction

44. The shorter wave length of the electron permits the detailed examination of tiny objects due to reduction of _____ effects
a. Reflection b. Diffraction c. Refraction d. Polarization

45. Which of the following recorder gives slow response
a. X-Y recorder b. Oscillographic c. Galvanometric d. Magnetic

46. The resolution limit of electron microscope is
a. 2 A.V b. 1 A.V c. 1.5 A.V d. 1.2 A.V

47. The slewing speed of X-Y recorder is
a. 1.6 m/s b. 1.3 m/s c. 1.4 m/s d. 1.5 m/s

48. The transducers that converts the input signal into the output signal, which is a discrete function of time is known as _____ transducer.
a. Active b. Analog c. Digital d. Pulse

49. Strain gauge, LVDT and thermocouple are examples of
a. Active transducers b. Passive transducers
c. Analog transducers d. Primary transducers

50. A strain gauge is a passive transducer and is employed for converting
a. Mechanical displacement into a change of resistance
b. Pressure into a change of resistance
c. Force into a displacement d. Pressure into displacement

51. Resolution of a transducer depends on
a. Material of wire b. Length of wire
c. Diameter of wire
d. Excitation voltage

52. The sensitivity factor of strain gauge is normally of the order of
a. 1 to 1.5 b. 1.5 to 2.0 c. 0.5 to 1.0 d. 5 to 10

53. Certain type of materials generates an electrostatic charge or voltage when mechanical force is applied across them. Such materials are called
a. Piezo-electric b. Photo-electric c. Thermo-electric d. Photo-resistive

54. Piezo electric crystal can produce an emf
a. When external mechanical force is applied to i
b. When radiant energy stimulates the crystal
c. When external magnetic field is applied
d. When the junction of two such crystals are heated

55. LVDT windings are wound on
a. Steel sheets b. Aluminium c. Ferrite d. Copper

56. The principle of operation of LVDT is based on the variation of
a. Self inductance b. Mutual inductance c. Reluctance d. Permanence

57. LVDT is an/a _____ transducer
a. Magneto-strict ion b. Inductive
c. Resistive d. Eddy current

58. S1: Transducer is a device which converts physical into electrical quantity
S2: Transducer is also called as sensor.
a. S1 is true & S2 is false b. S2 is true & S1 is false
c. Both S1 & S2 are true d. Both S1 & S2 are false

59. Venturi is associated with
a. Venous blood pressure b. Digital plethysmography
c. Dialysate flow in artificial kidney d. Blood flow in heart lung machine

60. The principle of operation of variable resistance transducer is
a. Deformation leads to change in resistance
b. Displacement of a contact slider on a resistance
c. Coupling of two coils changes with displacement
d. Movement of magnetic field produces variation in resistance of material

61. Pressure transducer for measuring blood pressure is
a. Strain gauge transducer only b. Strain gauge or capacitive transducer
c. Resistive transducer d. Fiber optic transducer

62. In foil strain gauge the thickness of foil varies from
a. 2.5 micron to 6 micron b. 25 micron (or) less
c. 25 micron to 60 micron d. 2.5 micron to 5 micron

63. Test electrode is also known as
a. Indicator electrode b. Reference electrode
c. Second electrode d. Primary electrode

64. _____ is the example of photo emissive cell
a. LDR b. Photo diode c. Photo transistor d. Photo multiplier

65. Fiber optic sensor can be used to sense _____
a. Displacement b. Power c. Current d. Resistance

66. The capacitance microphone is used for the detection of
a. Heart rate b. Blood flow c. Heart sound d. Foot pressure

67. Silver chloride electrode is used as a reference electrode due to its
a. Large half cell potential b. Stable half cell potential
c. Stable resting potential d. Stable action potential

68. The resistance of LDR _____ when exposed to radiant energy.
a. Remains unaltered b. Increases
c. Reaches maximum d. Decreases

69. An ideal amplifier has
    a. Noise figure of 0 db
    b. Noise figure of more than 0 db
    c. Noise factor of unity
    d. Noise figure of less than 1 db

70. Photo multiplier consists of
    a. 1 Photo emissive cathode & 2 dynodes
    b. 2 Photo emissive cathodes & 2 dynodes
    c. 2 Photo emissive cathodes & 1 dynode
    d. 1 Photo emissive cathode & 1 dynode

71. A balance beam scale uses which of the following units?
    a. Grams b. pounds c. ounces d. kilograms

72. Which of the following would be about the height of the average doorway?
    a. 2 meters b. 2 centimeters c. 2 millimeters d. 2 kilometers

73. A series dissipative regulator is an example of a:
    a. linear regulator
    b. switching regulator
    c. shunt regulator
    d. dc-to-dc converter

74. Which of the following is a unit of mass in the metric system?
    a. gram b. milliliter c. centimeter d. pounds

75. What device is similar to an RTD but has a negative temperature coefficient?
    a. Strain gauge b. Thermistor c. Negative-type RTD d. Thermocouple

76. The resistive change of a strain gauge
    a. is based on the weight placed upon it, but can be many thousands of ohms
    b. is usually no more than 100 omega.
    c. is based on the gauge factor, but is typically less than an ohm
    d. has a positive temperature coefficient

77. The output voltage of a typical thermocouple is
    a. Less than 100 mV
    b. Greater than 1 V
    c. Thermocouples vary resistance, not voltage
    d. None of the above

78. The connections to a thermocouple
    a. Can produce an unwanted thermocouple effect, which must be compensated for
    b. Produce an extra desirable thermocouple effect
    c. Must be protected, since high voltages are present
    d. Produce an extra desirable thermocouple effect and must be protected, since high voltages are present

79. What is the zero-voltage switch used for?
    a. To reduce radiation of high frequencies during turn-on of a high current to a load
    b. To control low-voltage circuits
    c. To provide power to a circuit when power is lost
    d. For extremely low-voltage applications

80. Temperature sensing can be achieved by the use of
    a. Thermocouples b. RTDs
    c. thermistors d. All of the above

81. The purpose of compensation for a thermocouple is
    a. to decrease temperature sensitivity
    b. to increase voltage output
    c. to cancel unwanted voltage output of a thermocouple
    d. used for high-temperature circuits

82. The change in value of an analog signal during the conversion process produces what is called the
    a. Quantization error b. Resolution error
    c. Nyquist error d. Sampling error

83. Which of the following performance specifications applies to a sample-and-hold circuit?
    a. Aperture time b. Aperture droop c. Feedback d.Acquisition jitter

84. RTDs are typically connected with other fixed resistors
    a. In a pi configuration b. In a bridge configuration
    c. And variable resistors d. And capacitors in a filter-type circuit

85. Holding current for an SCR is best described as
    a. The minimum current required for turn-off
    b. The current required before an SCR will turn on
    c. The amount of current required to maintain conduction
    d. The gate current required maintaining conduction

86. What is the moving part of a linear variable differential transformer?
    a. Primary b. Secondary c. Diaphragm d. Core

87. Thermistor, which has high temperature co-efficient of resistivity, is used as the sensing element in resistance thermometer. It is a/an
    a. insulator b. conductor
    c. solid semi-conductor d. liquid semi-conductor

88. Flapper nozzle is used in a/an _____ controller.
    a. electronic b. Hydraulic c. pneumatic d. none of these

89. Typical specifications for design stipulates the gain margin and phase margin to be respectively
    a. 1.7 and > 30° b. < 1.7 and > 30° c. < 1.7 and < 30° d. 1.7 and < 30°

90. Working principle of radiation pyrometer is based on the
    a. Seebeck effect b. Stafan-Boltzman law c. Kirchoffs law d. Wien's law

91. For the driving point impedance function, $Z(s)=[as^2+7s+3]/[s^2+3s+b]$, the circuit realization is shown below. The values of 'a' and 'b' respectively are
a. 4 and 5 b. 2 and 5 c. 2 and 1 d. 2 and 3

92. For the following driving point impedance functions, which of the following statements is true?
$Z_1(s)=(s+2)/(s^2+3s+5)$
$Z_2(s)=(s+2)/(s^2+5)$
$Z_3(s)=(s+2)/(s^2+2s+1)$
$Z_4(s)=(s+2)(s+4)/(s+1)(s+3)$
a. Z_1 is not positive real b. Z_1 is positive real
c. Z_3 is positive real d. Z_4 is positive real

93. The characteristic equation of the second order of the system is given by $s^2+2\delta\omega^2_o s+\omega^2_o=0$. The term ω_o is called:
a. over damped natural frequency b. under damped natural frequency
c. un damped natural frequency d. none of the above

94. Four terminal resistors are used for resistance values
a. Greater than 10 ohm b. Greater than 1 ohm
c. Less than 1 ohm d. Of the order of 1M ohm

95. What is the flux density of a magnetic field whose flux is 3000 μWb and cross-sectional area is 0.25 m² ?
a. 12,000 μ T b. 83,330 μ T
c. 0 μ T d. More information is needed in order to find flux density.

96. A system is described by the following state and output equations
$[dx_1(t)/dt] =-3x_1(t)+x_2(t)+2u(t)$
$[dx_2(t)/dt]=-2x_2(t)+u(t)$
$y(t)=x_1(t)$
where u(t) is the input and y(t) is the output. The system transfer function is
a. $(s+2)/(s^2+5s-6)$ b. $(s+3)/(s^2+5s+6)$ c. $(2s+5)/(s^2+5s+6)$ d. $(2s-5)/(s^2+5s-6)$

97. A two-port network is defined by the relation:
$I=5V_1+3V_2$
$I_2=2V_1-7V_2$The value of Z_{12} is
a. 3 b. -3 c. 3/41 d. 2/31

98. The Z-transform of x (K) is given by $x(Z)= \{(1-e^{-T})z^{-1}\} / \{(1-z^{-1})(1-e^{-T}z^{-1})\}$. The initial value of x(0) is
a. Zero b. 1 c. 2 d. 3

99. Two transformers operating in parallel will share their load depending upon their
a. Efficiency b. Per unit impedance c. Leakage reactance d. MVA ratings

100. Which type of loss is not common to transformers and rotating machines?
a. Eddy current loss b. Copper loss
c. Hysteresis loss d. Windage loss