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ENTRANCE EXAMINATION – JULY 2016

QUESTION PAPER

PROGRAMME: Ph. D

ELECTRICAL AND ELECTRONICS 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. The RMS value of the voltage $u(t) = 3 + 4\cos(3t)$ is
a. $\sqrt{17}V$ b. 5V c. 7V d. $(3+2\sqrt{2})V$

27. If $\bar{E}$ is the electric field intensity, $\nabla(\nabla \times \overline{E})$ is equal to
a. $\bar{E}$ b. $|\bar{E}|$ c. Null vector d. Zero

28. If $S = \int_1^{\infty} x^{-3}dx$, then S has the value
a. $\frac{-1}{3}$ b. $\frac{1}{4}$ c. $\frac{1}{2}$ d. 1

29. A system with zero initial conditions has the closed transfer function, $T(s) = \frac{s^2+4}{(s+1)(s+4)}$. The system output is zero at the frequency
a. 0.5 rad/sec b. 1 rad/sec c. 2 rad/sec d. 4 rad/sec

30. Which three-phase connection can be used in a transformer to introduce a phase difference of 30° between its output and corresponding input time voltages
a. Star-Star b. Star-Delta c. Star-Delta d. Delta-Zigzag

31. An 800kV transmission line has a maximum power transfer capacity of P. If it is operated at 400kV with the series reactance unchanged, then the new maximum power transfer capacity is approximately
a. P b. 2P c. P/2 d. P/4

32. The insulation strength of an EHV transmission line is mainly governed by
a. Load power factor b. Switching over voltages
c. Harmonics d. Corona

33. High Voltage DC (HVDC) transmission is mainly used for
    a. Bulk power transmission over very long distances
    b. Inter-connecting two systems with the same nominal frequency
    c. Eliminating reactive power requirement in the operation
    d. Minimizing harmonics at the converter stations

34. The Q–meter works on the principle of
    a. Mutual inductance b. Self inductance
    c. Series resonance d. Parallel Resonance

35. A digital-to-analog converter with a full-scale output voltage of 3.5V has a resolution close to 14mV. Its bit size is
    a. 4 b. 8 c. 16 d. 32

36. The conduction loss versus device current characteristic of a power MOSFET is best approximated by
    a. A parabola b. A straight line
    c. A rectangular hyperbola d. An exponentially decaying function

37. Under no load condition, if the applied voltage to an induction motor is reduced from the rated voltage to half the rated value,
    a. The speed decreases and the stator current increases
    b. Both the speed and the stator current decreases
    c. The speed and the stator current remain practically constant
    d. There is negligible change in the speed but the stator current decreases

38. A silicon diode measures a low value of resistance with the meter leads in both positions. The trouble, if any, is
    a. the diode is open. b. the diode is shorted to ground.
    c. the diode is internally shorted. d. the diode is working correctly.

39. Temperature rise of a motor is 40˚C after 1 hour and 60˚C after 2 hours under a particular loading condition. What is the steady state temperature?
    a. 80˚C b. 20˚C c. 40˚C d. 50˚C

40. Commutation of the thyristors by the reactive power developed by the motor is called
    a. Forced commutation b. Load commutation
    c. Natural Commutation d. Line commutation

41. The rated frequency of an induction motor is 50 Hz and Tm = 100 Nm. If the motor is now operated at 75 Hz, then the new maximum torque is
    a. 44.4 Nm b. 88.8 Nm c. 40 Nm d. 80 Nm

42. If 40 is the resistance and 0.75 is the duty cycle for induction motor speed control using chopper, what is the effective value of resistance?
    a. 10Ω b. 20 c. 5 d. 15

43. The portion of air gap power which is not converted into mechanical power is given by

a. sPag b. (1-s)Pag c. (1+s)Pag d. –sPag

44. A salient pole motor without a field winding is called
    a. Reluctance motor b. PM synchronous motor
    c. Induction motor d. DC motor

45. To use the machine voltage for commutation, a synchronous motor fed from a CSI should be operated at
    a. lead pf b. lag pf c. unity pf d. none

46. PMSM are commonly known as
    a. PMAC motor b. PMDC motor c. Both d. None

47. An electric drive consisting of load side converter is known as
    a. commutator less dc motor b. Hysterisis motor
    c. Synchronous motor d. Induction motor

48. Voltage induced in the rotor of induction motor when it runs at synchronous speed is
    a. very near input voltage to stator b. slip times the input voltage
    c. zero d. none of the above

49. The latching current of SCR is 18 mA. Its holding current is
    a. 6 mA b. 18 mA c. 54 mA d. 12 mA

50. When the SCR conducts, the forward voltage drop
    a. is 0.7V b. is 1 to 1.5 V
    c. increases slightly with load current d. remains constant with load current

51. Static Induction Thyristors have
    a. high dv/dt and low di/dt b. low dv/dt and high di/dt
    c. low dv/dt and low di/dt d. high dv/dt and high di/dt

52. In a power MOSFET switching times are of the order of few
    a. seconds b. milliseconds c. microseconds d. Nanoseconds

53. Thermal runaway of thyristors occurs
    a. when load is suddenly withdrawn
    b. if the temperature of thyristor is high
    c. in case forward anode to cathode voltage is greater than the forward breakdown voltage
    d. in case gate current is high

54. The efficiency of a chopper can be expected in the range
    a. 50 to 55% b. 65 to 72 % c. 82 to 87 % d. 92 to 99 %

55. Opto coupler combine
    a. SITs and BJTs
    b. IGBTs and MOSFETs
    c. Power transformers and silicon transistor

d. infrared light emitting diode and a silicon photo transistor

56. The major application of chopper drive is in
    a. traction b. computers c. heating furnaces d. miniature motors

57. A Schottky diode is a
    a. majority carrier device b. minority carrier device
    c. fast recovery diode d. both a. andb.

58. In resonant pulse inverters
    a. dc output voltage variation is wide b. the frequency is low
    c. the output voltage is sinusoidal d. dc saturation of transformer core is minimized.

59. The steady-state error of a feedback control system with an acceleration input becomes finite in a
    a.type 0 system. b.type 1 system. c.type 2 system. d.type 3 system.

60. The impulse response of a LTI system is a unit step function, then the corresponding transfer function is
    a. 1/s b. $1/s^2$ c. 1 d. s

61. For a type one system, the steady – state error due to step input is equal to
    a. infinite. b. zero c. 0.25 d. 0.5.

62. The equation $2s^4+ s^3 +3s^2 +5s +10=0$ has ---- roots in the left half of s–plane.
    a. one b. two c. three d. four

63. A system with gain margin close to unity or a phase margin close to zero is
    a. highly stable. b. oscillatory. c. relatively stable. d. unstable.

64. The damping ratio of a system having the characteristic equation $s^2+2s+8=0$
    a. 0.353 b. 0.330 c. 0.300 d. 0.250

65. The input to a controller is
    a. sensed signal b. desired variable value.
    c. error signal d. servo-signal.

66. Electrical time-constant of an armature-controlled dc servomotor is
    a. equal to mechanical time-constant. b. smaller than mechanical time-constant.
    c. larger than mechanical time-constant. d. not related to mechanical time-constant.

67. Peak overshoot of step-input response of an underdamped second-order system is explicitly indicative of
    a. settling time b. rise time. c. natural frequency d. damping ratio.

68. If the transfer function of a first-order system is $G(s) = \frac{10}{1+2s}$ then the time constant of the system is
    a. 10 seconds. b. 1/10 second c. 2 seconds. d. ½ seconds

69. A dc ammeter has a resistance of 0.1Ω and its current range is 0-100A. If the range is to be extended to 0-500A, then the meter requires the following shunt resistance
a. 0.010 Ω b. 0.01 Ω c. 0.025 Ω d. 1.0 Ω

70. In a transformer, zero voltage regulation at full load is
a. Not possible b. Possible at unity power factor load
c. Possible at leading power factor load d. Possible at lagging power factor load

71. The octal equivalent of the HEX number AB.CD is
a. 253.314 b. 253.632 c. 526.314 d.526.632

72. The dc motor, which can provide zero speed regulation at full load without any controller, is
a. Series b. Shunt
c. Cumulative compound d. Differential compound

73. A single phase fully controlled bridge converter supplies a load drawing constant and ripple free load current. If the triggering angle is 30°, the input power factor will be
a. 0.65 b. 0.78 c. 0.85 d. 0.866

74. X is a uniformly distributed random variable that takes value between 0 and 1. The value of $E\{X\}^3$ will be
a. 0 b. 1/8 c. ¼ d. ½

75. Distributed winding and short chording employed in AC machines will result in
a. Increase in emf and reduction in harmonics
b. Reduction in emf and increase in harmonics
c. Increase in both emf and harmonics
d. Reduction in both emf and harmonics

76. Keeping in view the cost and overall effectiveness, the following circuit breaker is best suited for capacitor bank switching.
a. Vacuum b. air blast c. SF_6 d. oil

77. A synchronous generator is feeding a zero power factor (lagging) load at rated current. The armature reaction is
a. Magnetising b. Demagnetising c. cross-magnetising d. ineffective

78. Leakage flux in an induction motor is
a. Flux that leaks through the machine
b. Flux that links both stator and rotor windings
c. Flux that links none of the windings
d. Flux that links the stator winding or the rotor winding but not both

79. A 4-pole induction motor supplied by a slightly unbalanced three phase 50Hz source is rotating at 1440 rpm. The electrical frequency in Hz of the induced negative sequence current in the rotor is
a. 100 b. 98 c. 52 d. 48

80. Laminated insulations coated with varnish are normally used in the transformer
    a. To reduce reluctance of magnetic path
    b. To reduce the effect of eddy current
    c. To increase the reluctance of magnetic path
    d. To reduce the hysteresis effect

81. The required thickness of lamination in a transformer decreases when
    a. The applied frequency increases b. The applied frequency decreases
    c. The applied voltage increases d. The applied voltage decreases

82. Oil in transformer is used to
    a. Transfer electrical energy b. Insulate the windings
    c. Cool the windings d. None of the above

83. The windings of a transformer are divided into several coils because
    a. It is difficult to wind as one coil b. It reduces voltage per coil
    c. It requires less insulation d. None of the above

84. Transformer humming sound is reduced by the
    a. Proper bracing of transformers assemblies b. Proper insulation
    c. Proper design d. Proper design of winding

85. Sludge in transformer oil is due to
    a. Decomposition of oil b. Decomposition of insulation
    c. Moisture content in oil d. None of the above

86. A transformer used only for electrical isolation between two circuits has turns ratio which is
    a. More than unity b. Less than unity
    c. Equal to unity d. More than 0.5

87. If 90 per cent of normal voltage and 90 per cent of normal frequency are applied to a transformer, the per cent charge in hysteresis losses will be
    a. 20% b. 4.7% c. 19% d. 21%

88. If 110 per cent of normal voltage and 110 per cent of normal frequency is applied to a transformer, the percentage change of eddy current losses will be
    a. 10% b. 20% c. 25% d. 21%

89. A single-phase, 2,200/200 V transformer takes 1 A at the *HT* side or no load at a power factor of 0.385 lagging. The iron losses are
    a. 167 W b. 77 W c. 88 W d. 98 W

90. Neglecting resistance, at constant flux density, the power required per kilogram to magnetize the iron core of a transformer is 0.8 W at 25 Hz and 2.04 W at 60 Hz. The power required per kilogram for 100 Hz is
    a. 3.8 W b. 3.63 W c. 3.4 W d. 5.2 W

91. The flux involved in the emf equation of a transformer has
a. rms value b. Average value c. Total value d. Maximum value

92. The no-load current in a transformer lags the applied voltage by
a. 90° – 95° b. About 80° – 85° c. 0° – 15° d. About 110°

93. High leakage impedance transformers are used for applications such as
a. Power distribution b. Electrical toys
c. Arc welding d. Fluorescent lamps

94. A transformer 2,000 kVA, 250 Hz is operated at 50 Hz. Its kVA rating should be revised to
a. 400 kVA b. 10,000 kVA c. 2,000 kVA d. Cannot be revised

95. The rotating part of a DC machine is
a. armature b. field c. both a. and b. d. none of these

96. The actual generated voltage in a DC generator is
a. direct b. alternating c. partly a. and b. d. none of these

97. The function of a commutator in a DC machine is
a. to provide easy speed control b. to improve commutation
c. to convert alternating voltage to direct voltage d. to convert ac current to DC current

98. The laminated parts of a DC machine are armature and
a. pole shoe b. core c. yoke d. pole

99. Residual magnetism is necessary in a DC
a. shunt motor b. series motor
c. separately excited generator d. shunt generator

100. A bulb in a staircase has two switches, one switch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by any one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles
a. An AND gate b. an OR gate c. an XOR gate d. a NAND gate