ENTRANCE EXAMINATION FOR ADMISSION, MAY 2013.

Ph.D. ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE CODE : 141

Register Number : [ ]

Signature of the Invigilator
(with date)

COURSE CODE : 141

Time : 2 Hours Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you –1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. The range of wind speed suitable for wind power generator is

(A) 0 to 5 m/s (B) 5 to 25 m /s

(C) 25 m/s to 50 m/s (D) 50 m/s to 75 m/s

2. A wind turbine extracts maximum power from wind, when the downstream wind speed reduces to

(A) one-third that of upstream wind (B) half that of upstream wind

(C) two-third that of upstream wind (D) zero

3. If the speed of a wind stream remains unchanged while passing through the rotor

(A) a large power will be generated

(B) zero power will be generated

(C) the flow is known as stalled flow

(D) the speed of the rotor will be very high

4. Grid – connected wind generators usually have maximum penetration of

(A) 10 to 20 % (B) 20 to 30 % (C) 30 to 40 % (D) 40 to 50 %

5. Stall regulation is used with turbines

(A) having diameters less than 25 m (B) having diameters more than 25 m

(C) having rotors of large solidity (D) having rotors with pitch control

6. When VAR flow in a circuit is increased, losses in the circuit are

(A) reduced

(B) not changed

(C) reduced if the circuit is inductive and increased if the circuit is capacitive

(D) increased

7. The equality constraint, when the transmission line losses are considered is given by,

(A) $\sum_{i=1}^{n} P_{Gi} - P_{Loss} = 0$ (B) $\sum_{i=1}^{n} P_{Gi} - P_D = P_{Loss} + P_G$

(C) $\sum_{i=1}^{n} P_{Gi} - P_D = 0$ (D) $\sum_{i=1}^{n} P_{Gi} = P_D + P_{Loss}$

8. The fuel cost of a unit is given by $C = 1.5 + 20\ P_G + 0.1\ P^2_G$ where P_G is the unit output in MW. The incremental fuel cost at an output of 100 MW is

(A) 60 Rs. / MWh (B) 40 Rs. / MWh

(C) 100 Rs. /MWh (D) 20 Rs. / MWh

9. For economic schedule of a load of 180 MW, the plant outputs P_1 and P_2 are given by

(A) $P_1 = 100$ MW; $P_2 = 80$ MW (B) $P_1 = 90$ MW; $P_2 = 90$ MW

(C) $P_1 = 80$ MW; $P_2 = 100$ MW (D) $P_1 = 120$ MW; $P_2 = 60$ MW

10. To determine the units that should operate for a particular load is the problem of

(A) Unit commitment (B) Optimal load scheduling

(C) Economic dispatch (D) Optimal power flow

11. In the priority list method, the units are arranged to commit the load demand in the order of

(A) Ascending costs of units (B) Descending costs of units

(C) Either (A) or (B) (D) Independent of costs of units

12. In the optimization problem of a hydro-thermal system, which of the following are chosen as independent variables?

(A) Water storages in all sub-intervals except one sub-interval

(B) Water inflows in all sub-intervals except one sub-interval

(C) Water discharges in all sub-intervals except one sub-interval

(D) Hydro and thermal generations, water storages at all intervals, and water discharge at one sub-interval

13. The basic function of LFC is

(A) To maintain frequency for variations in real-power demand

(B) To maintain voltage for variations in real-power generation

(C) To maintain both voltage and frequency for variations in real-power demand

(D) To maintain both voltage and frequency for variations in real-power generation

14. The primary control loop in generator control is

(A) Linkage mechanism (B) Fly-ball speed governor

(C) Speed changer (D) Hydraulic amplifier

15. Damping of frequency oscillations for a two-area system is more with

(A) Low-R (B) $R = \infty$

(C) High R (D) Independent of R

16. For synchronous condensers, the p.f. improvement apparatus should be located at

(A) Sending end (B) Receiving end

(C) Location is not important (D) Middle of the line

17. In synchronous condensers, leading VARs are produced by

(A) Increasing field current (B) Decreasing field current

(C) Increasing speed of the machine (D) Decreasing speed of the machine

18. VARs always flow from

(A) Points of higher angle to points of lower angle

(B) Points of lower angle to points of higher angle

(C) Points of higher voltage to points of lower voltage

(D) Points of lower voltage to points of higher voltage

19. In contingency ranking, the severest fault will be ranked

(A) 1 (B) Last

(C) Will depend on the type of fault (D) Will depend on the duration of fault

20. The smaller the lagging reactive power drawn by a circuit, its p.f. will be

(A) Better (B) Poorer (C) Unity (D) Zero

21. The turn-on time of SCR with inductive load is 30 μs. The pulse train frequency is 3.0 kHz with mark / space ratio of $\frac{1}{10}$ then the SCR will

(A) Turn-on

(B) Not turn-on

(C) Turn-on if inductance is removed

(D) Turn-on if pulse frequency is increased to two times.

22. The main reason for connecting a pulse transformer at the output stage of a thyristor triggering circuit is to

(A) Amplify the power of triggering pulse

(B) Provide electrical isolation

(C) Reduce the turn-on time of the thyristor

(D) Avoid spurious triggering of thyristor due to noise

23. A three phase semi-converter feeds the armature of a separately exited dc motor supplying a non zero torque. For steady state operation the motor, armature current is found to drop to zero at certain instances of time. At such instances the voltage assumes a value which is

(A) Equal to the instantaneous value of the ac phase voltage

(B) Equal to the instantaneous value of the motor back e.m.f

(C) Arbitrary

(D) Zero

24. For very high and ultra high frequency applications, which of the following is preferred?

(A) SIT (B) IGBT (C) MOSFET (D) BJT

25. An SMPS circuit operating at 20 kHz to 100 kHz range uses which of the following elements

(A) Thyristor (B) TRIAC (C) UJT (D) MOSFET

26. The converter that can operate in both 3-phase and 6-phase is

(A) 6-phase, full converter
(B) 6-phase, semi converter
(C) 3-phase, full converter
(D) 3-phase, semi converter

27. If a single-phase voltage converter feeds an induction motor and heater then

(A) In both the loads, fundamental and harmonics are useful
(B) In both the loads, only fundamental is useful
(C) In induction motor only fundamental is used and in heater, both fundamental and harmonics are useful
(D) In induction motor both fundamental and harmonics are useful and in heater only fundamental is useful

28. A thyristorised, three-phase, fully controlled converter feeds a dc load that draws a constant current. Then input ac line current to the converter has

(A) An rms value equal to the dc load current
(B) An average value equal to the dc load current
(C) A peak value equal to dc load current
(D) A fundamental frequency component whose r.m.s value is equal to dc load current

29. In an AC motor control, the ratio of voltage to frequency is maintained constant in order to

(A) Make maximum use of magnetic circuit
(B) Maximize the current drawn from the supply to provide torque
(C) Make minimum use of magnetic circuit
(D) None of the above

30. If speed of a dc shunt motor is increased above its rated speed, then its counter emf

(A) increases
(B) decreases
(C) remains unchanged
(D) first increases and then decreases

31. The function of a dc motor starter is to

(A) start the dc motor
(B) limit the starting current
(C) increase the starting torque
(D) avoid dips in the supply voltage

32. A synchronous motor, fed from infinite bus, is delivering half-full load. If an increase in field current causes an increase = in the armature current, then the motor will

(A) deliver reactive power and active power to the bus

(B) absorb reactive power and active power to the bus

(C) absorb reactive power from the bus and deliver active power to the bus

(D) deliver reactive power to the bus and absorb active power from the bus

33. A salient – pole synchronous motor is running with normal excitation. If the excitation is reduced to zero

(A) it becomes an induction motor (B) it becomes a reluctance motor

(C) it remains a synchronous motor (D) the motor would stop

34. The torque –slip characteristics of a poly-phase induction motor becomes almost linear at small values of slip, because in this range of slips,

(A) the effective rotor-circuit resistance is very large compared to the rotor reactance

(B) the rotor resistance is equal to the stator resistance

(C) the rotor resistance is equal to the rotor reactance

(D) the rotor reactance is equal to the stator reactance

35. The most common application of 3- phase induction generator can be in a

(A) steam-power station (B) hydro-power station

(C) wind-power station (D) nuclear –power station

36. A signal is an energy signal if

(A) E = 0, P = 0 (B) E = ∞, P = finite

(C) E = finite, P = 0 (D) E = finite, P = ∞

37. $Y(n) = x(2n)$ is for a

(A) time-invariant system

(B) time varying, dynamic system

(C) linear, time varying, dynamic system

(D) linear, time-invariant, static system

38. The circular convolution of $x(n) = \{1,2,1\}$ and h(n) = {2,1,2} is

(A) {7,7,6} (B) {6,7,6} (C) {6,7,6,0} (D) {0,7,7,6}

39. If $x(n) \xleftrightarrow{ZT} X(z)$, then the initial value theorem states that x(0) =

(A) $\lim_{z \to 1} (z-1)\, X(z)$ (B) $\lim_{z \to 1} X(z)$

(C) $\lim_{z \to \infty} X(z)$ (D) $\lim_{z \to \infty} z\, X(z)$

40. The Z-transform of a signal with X(s) = (1/s) is

(A) $\frac{1}{1-Z^{-1}}$ (B) $\frac{1}{1-Z}$ (C) $\frac{1}{1+Z^{-1}}$ (D) $\frac{z}{1-Z}$

41. A system whose output y(n) at time n depends only on present and past input values is called a

(A) recursive system (B) non- recursive system

(C) causal system (D) non-causal system

42. The DTFT of a sequence x(n) is defined as X(𝕀) =

(A) $\sum_{n=-\infty}^{\infty} x(n)e^{j\omega n}$ (B) $\sum_{n=-\infty}^{\infty} x(n)e^{-j\omega n}$

(C) $\sum_{n=0}^{\infty} x(n)e^{j\omega n}$ (D) $\sum_{n=0}^{\infty} x(n)e^{-j\omega n}$

43. The number of complex multiplications involved in the computation of 256-point DFT by radix -2 FFT is

(A) 256 (B) 1024 (C) 512 (D) 128

44. In the bilinear transformation, the relation between s and z is

(A) $s=\frac{2}{T}\left(\frac{1+z^{-1}}{1-z^{-1}}\right)$ (B) $s=\frac{1}{T}\left(\frac{1+z^{-1}}{1-z^{-1}}\right)$

(C) $s=\frac{2}{T}\left(\frac{1-z^{-1}}{1+z^{-1}}\right)$ (D) $s=\frac{1}{T}\left(\frac{1-z^{-1}}{1+z^{-1}}\right)$

45. Interpolation results in

(A) decrease in sampling rate (B) increase in sampling rate

(C) no change in sampling rate (D) random change in sampling rate

46. Which of the following characteristics are true for a RISC processor?

(A) Smaller control unit

(B) Small instruction set

(C) Short program length

(D) Less traffic between CPU and memory

47. Which of the following is an undesirable dynamic characteristic of an instrument?

(A) Reproducibility (B) Dead zone

(C) Time lag (D) Static error

48. Flapper nozzle is used in a/an _____ controller.

(A) electronic (B) hydraulic (C) pneumatic (D) none of these

49. The closed loop pole of a stable second order system could be

(A) both real and positive

(B) complex conjugate with positive real parts

(C) both real and negative

(D) one real positive and the other real negative

50. Smoke density of the flue gas going out of the chimney is measured by a

(A) polarograph (B) thermal conductivity meter

(C) photo electric cell (D) chromatograph

51. Which of the following controllers has the least maximum deviation ?

(A) *P*-controller (B) *P-I* controller

(C) *P-I-D* controller (D) *P-D* controller

52. The transfer function for a PID controller is (where, τ_i is the integral (reset) time and τ_D is the derivative time)

(A) $K_C(1+\tau_i s+\tau_D)s$ (B) $K_C\left(1+\frac{1}{\tau_i s}+\tau_D s\right)$

(C) $K_C\left(1+\tau_i s+\frac{1}{\tau_D s}\right)$ (D) $K_C\left(1+\frac{1}{\tau_i s}+\frac{1}{\tau_D s}\right)$

53. Which of the following thermocouples can measure the maximum temperature ?

(A) Platinum-rhodium (B) Tungsten-molybdenum

(C) Chromel-alumel (D) Iron-constantan

54. In a closed loop system, the process to be controlled is an integrating process with transfer function $1/2s$. The controller proposed to be used in an integral controller with transfer function $1/T_1 s$. When a step change in set point is applied to such a closed loop system, the controlled variable will exhibit

(A) overdamped response (B) underdamped response

(C) undamped response (D) unstable response

55. The graph of an electrical network has N nodes and B branches. The number of links L, with respect to the choice of a tree, is given by

(A) B–N+1 (B) B+N (C) N–B+1 (D) N–2B–1

56. Which of the systems having the following transfer function is stable ?

(A) $\frac{1}{s^2+2}$ (B) $\frac{1}{s^2-2s+3}$ (C) $\frac{1}{s^2+2s+2}$ (D) $\frac{e^{-20s}}{s^2+2s-1}$

57. The transfer function for a first order process with time delay is

(A) $\frac{e^{T_d s}}{Ts+1}$ (B) $\frac{e^{-T_d s}}{Ts+1}$

(C) $\frac{1}{(Ts+1)(T_d s+1)}$ (D) $\frac{T_d s}{Ts+1}$

58. Which of the following is not a mechanical pressure sensing element?

(A) Bellows (B) Diaphragm (C) Bourdon tube (D) U-tube

59. Which of the following is not a differential pressure flow meter ?

(A) Rotameter (B) Flow nozzle

(C) Orificemeter (D) Venturimeter

60. Time constant is the

(A) time taken by the controlled variable to reach 63.2% of its full change

(B) same as transportation lag

(C) same as dead time

(D) time required by the measured variable to reach 63.2% of its ultimate change

61. E.m.f. generated by thermocouples is of the order of

(A) milli volts (B) micro volts (C) volts (D) kilo volts

62. Response of a linear control system for a change in set point is called

(A) frequency response (B) transient response

(C) servo problem (D) regulator problem

63. Mcleoid gauge is used to measure the

(A) point velocity (B) flow rate

(C) vacuum (D) pressure

64. When the damping co-efficient (ξ) is unity, the system is

(A) Over damped (B) Critically damped

(C) Under damped (D) Highly fluctuating

65. Back- to- back HVDC is used to

(A) increase the transmission capability

(B) decrease line-losses

(C) provide stable interconnection

(D) reduce voltage drop

66. If response of a control system is to be free of offset and oscillation, the most suitable controller is

(A) proportional controller

(B) proportional-derivative(PD)controller

(C) proportional-integral (PI) controller

(D) proportional integral-derivative (PID) controller

67. An embedded microcontroller means

(A) A microcontroller for the embedded systems

(B) Microcontroller with embedded processor

(C) A microcontroller with external memories storing the embedded software

(D) Single –chip microcontroller –based embedded system

68. 8257 is for DMA transfer

(A) from peripheral to RAM

(B) from RAM to peripheral

(C) between peripheral and RAM

(D) between floppy disk controller and RAM

69. A DAC output uses a low pass filter

(A) for line noise filtering

(B) to reduce the effect of sharp 1 to 0 transition and 0 to 1 transitions at the DAC input

(C) to drive low frequency output

(D) to drive dc motor

70. Seven-segment LED display glows only vertical and middle segments only. The displayed character will be

(A) H (B) B (C) A (D) E

71. An optoisolator

(A) insulates the port pins of MCU

(B) insulates the inputs from the interfacing motors, power devices, coils and relays

(C) insulates the input from an output

(D) insulates the outputs from the power inputs

72. IEEE488 (GPIB) bus has

(A) 16 lines (B) 24 lines (C) 18 lines (D) 20 lines

73. Stepper motor moves one step angle when

(A) current is transferred from one coil to the neighboring coil

(B) insulates the input

(C) current is switched on in the neighboring coil

(D) when the current is given all the coils

74. Interfacing circuit for a thermocouple is used for measuring temperatures

(A) voltage developed is measured

(B) current developed is measured

(C) resistance is measured

(D) resistance change is measured by MCU

75. For a robot wrist, _____ is used.

(A) DC motor (B) Stepper motor

(C) Servomotor (D) Induction motor

76. For industrial control

(A) An advanced EPA (Event Processor Array) structure, PWM, WFG and multi-channel on-chip,ADC feature

(B) Input capture and out compare units

(C) Power IO

(D) An advanced EPA (Event Processor Array) structure, PWM and multi-channel on-chip ADC feature are must

77. A servomotor control uses

(A) timers (B) out compare features

(C) real time features (D) PWM outputs

78. A multi-touch screen senses by tow touch finger gestures such as zoom in, zoom out and rotate using

(A) touch-screen controller

(B) touch-screen controller, driver and library

(C) touch-screen controller and driver

(D) multi-touch library

79. Assembler is a tool to

(A) develop and editing source file in assembly language and create list and object files, and object file is executable after linking / location

(B) develop and editing compiled file in assembly language and create object file, which is executable after linking / locating

(C) assemble file in assembly language and create object file, which is executable after linking/ locating

(D) assemble macros

80. If the step angle of the VR stepper motor is very small, then the modes of excitation is called as

(A) Full step operation

(B) 2 phase on mode

(C) Half step operation

(D) Micro stepping operation

81. The position sensor used in PMBLDC motor is

(A) LVDT

(B) Tachogenerator

(C) Strain Gauge

(D) Position sensor

82. The learning rate in Neural network is used to

(A) calculate the final output

(B) control the amount of weight adjustment

(C) make convergence faster

(D) control the degree of similarity

83. The method of membership value assignments based on common intelligence of human is

(A) Inference

(B) Intuition

(C) Rank Ordering

(D) Inductive reasoning

84. The process of fuzzy quantity into a precise quantity in fuzzy system theory is

(A) Fuzzification

(B) Membership value assignments

(C) Defuzzification

(D) Aggregation

85. Which operation of genetic algorithm prevents the algorithm to be trapped in a local minimum?

(A) Selection

(B) Mutation

(C) Cross over

(D) Reproduction

86. A 64-bit word consists of

(A) 4 bytes (B) 8 bytes (C) 10 bytes (D) 12 bytes

87. How many storage locations are available when a memory device has 12 address lines?

(A) 144 (B) 512 (C) 2048 (D) 4096

88. FIFO is formed by an arrangement of

(A) Diodes (B) Transistors

(C) MOS cells (D) Shift registers

89. What are the following sequence of steps taken in designing a fuzzy logic machine?

(A) Fuzzification → Rule evaluation → Defuzzification

(B) Rule evaluation → Fuzzification → Defuzzification

(C) Fuzzy Sets → Defuzzification → Rule evaluation

(D) Defuzzification → Rule evaluation → Fuzzification

90. During the analysis of Thevenin's and Norton's theorems

(A) Voltage sources are short –circuited and current sources are open – circuited

(B) Voltage sources are open –circuited and current sources are short – circuited

(C) Both voltage and current sources are short circuited

(D) Both voltage and current sources are open-circuited

91. This filter transmits all frequencies lying between two-cut-off frequencies and attenuates all frequencies below lower cut-off frequency and upper cut off frequency.

(A) low pass (B) high pass (C) band pass (D) None

92. Which of the following is the source of non-linearity?

(A) Backlash in gears (B) Saturation

(C) Both (A) and (B) (D) Resistance

93. The given matrix is $\begin{bmatrix} 4 & -4 & 2 \\ -4 & 5 & -2 \\ 2 & -2 & 1 \end{bmatrix}$

(A) positive semi definite (B) negative semi definite

(C) positive definite (D) negative definite

94. Addition of tubes to the transformer tank improves heat dissipation capacity because of

(A) additional cooling surface

(B) additional dissipation by radiation only

(C) additional dissipation by convection only

(D) additional dissipation by radiation and convection both

95. Armature reaction in a synchronous motor at rated voltage and zero power factor (lead) is

(A) magnetizing

(B) cross – magnetizing

(C) both magnetizing and cross – magnetizing

(D) demagnetizing

96. A 3-phase slip-ring induction motor is fed form the rotor side with stator winding short-circuited. The frequency of the currents in the short-circuited stator is

(A) slip frequency

(B) supply frequency

(C) frequency corresponding to rotor speed

(D) zero

97. Which of the following IC is the timer?

(A) 8255 (B) 8257 (C) 8259 (D) 8254

98. A wide range instrument should have

(A) square –law scale (B) linear scale

(C) logarithmic scale (D) exponential scale

99. The current coil of a wattmeter is connected to the CT of R phase. The potential coil is connected across Y and B phases. The wattmeter measures

(A) active power in Y phase (B) reactive power in B phase

(C) active power in R phase (D) reactive power in R phase

100. Demorgan's first theorem shows the equivalent of

(A) OR gate and Exclusive OR gate (B) NOR gate and Bubbled gate

(C) NOR gate and NAND gate (D) NAND gate and NOT gate