TEST BOOKLET
LECT (INST. ENGG.) T.E.-2016

Time Allowed : 2 Hours] [Maximum Marks : 100

All questions carry equal marks.

INSTRUCTIONS

1. Immediately after the commencement of the examination, you should check that test booklet does not have any unprinted or torn or missing pages or items, etc. If so, get it replaced by a complete test booklet.

2. Write your Roll Number only in the box provided alongside. Do not write anything else on the Test Booklet.

3. This Test Booklet contains 100 items (questions). Each item comprises four responses (answers). Choose only one response for each item which you consider the best.

4. After the candidate has read each item in the Test Booklet and decided which of the given responses is correct or the best, he has to mark the circle containing the letter of the selected response by blackening it completely with Black or Blue ball pen. In the following example, response "C" is so marked:

| A | B | C | D |

5. Do the encoding carefully as given in the illustrations. While encoding your particulars or marking the answers on answer sheet, you should blacken the circle corresponding to the choice in full and no part of the circle should be left unfilled. After the response has been marked in the ANSWER SHEET, no erasing/fluid is allowed.

6. You have to mark all your responses ONLY on the ANSWER SHEET separately given according to 'INSTRUCTIONS FOR CANDIDATES' already supplied to you. Responses marked on the Test Booklet or in any paper other than the answer sheet shall not be examined.

7. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. There will be no negative marking.

8. Before you proceed to mark responses in the Answer Sheet fill in the particulars in the front portion of the Answer Sheet as per the instructions sent to you.

9. If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct.

10. After you have completed the test, hand over the Answer Sheet only, to the Invigilator.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

P.T.O.
1. If two-port network is reciprocal, which of the following is not true?
   - (A) $z_{21} = z_{12}$
   - (B) $y_{21} = y_{12}$
   - (C) $h_{21} = h_{12}$
   - (D) $AD = BC + 1$

2. A series RLC circuit has $Q_0 = 5.1$ at its resonant frequency of 100 kHz. Assuming the power dissipation of the circuit is 100 W when drawing a current of 0.8 A, find the bandwidth of the circuit.
   - (A) 19.6 kHz
   - (B) 1.96 kHz
   - (C) 29.6 kHz
   - (D) None of these

3. The number of f-cuts in a graph is, where $v$ is number of vertices.
   - (A) $v - 1$
   - (B) $v$
   - (C) $v + 1$
   - (D) None of these

4. If $f(t) = \sin 10t + \sin 20t$; what is the rms value of $f(t)$?
   - (A) 1
   - (B) 0.5
   - (C) $\pi$
   - (D) 1.414

5. A silicon PN junction is forward biased with a constant current source at room temperature. When the room temperature is increased by 10°C, the forward bias voltage across the PN junction:
   - (A) increases by 60 mV
   - (B) decreases by 60 mV
   - (C) increases by 25 mV
   - (D) decreases by 25 mV
6. Drift current in semiconductors depends upon:
   (A) only the electric field
   (B) only the carrier concentration gradient
   (C) both the electric field and the carrier concentration
   (D) both the electric field and the carrier concentration gradient

7. The following is not associated with a p-n junction:
   (A) junction  (B) charge storage capacitance
   (C) depletion capacitance  (D) channel length modulation

8. A Zener diode, when used in voltage regulator stabilization circuits, is biased in:
   (A) reverse bias region below the breakdown voltage
   (B) reverse breakdown region
   (C) forward bias region
   (D) forward bias constant current mode

9. The phenomenon known as “Early Effect” in a bipolar transistor refers to a reduction of effective base-width caused by:
   (A) electron-hole recombination at the base
   (B) the reverse biasing of the base-collector junction
   (C) the forward biasing of emitter-base junction
   (D) the early removal of stored base charge during saturation-to-cut off switching
10. If the differential voltage gain and the common mode gain of a differential amplifier are 50 dB and 4 dB respectively, then its CMRR is:
   (A) 54 dB   (B) 12.5 dB
   (C) 46 dB   (D) infinite

11. The Cascade amplifier is a multi-stage configuration of:
   (A) CC-CB   (B) CE-CB
   (C) CC-CE   (D) CC-CC

12. Three identical amplifiers with each having a voltage gain of 50 are cascaded. The open loop circuit voltage gain of the combined amplifier is:
   (A) 49 dB   (B) 51 dB
   (C) 98 dB   (D) 102 dB

13. Second order notch filter can be realized by adding following filter responses:
   (A) band-pass and all-pass   (B) band-pass and low-pass
   (C) band-pass and high pass   (D) none of these

14. Which of the following blocks comprise a PLL?
   (A) VCO   (B) Phase detector
   (C) LPF   (D) All of these
15. If a non-inverting amplifier is used as a block in realizing an oscillator, then the feedback network must ensure a phase shift of:

(A) 180°  (B) 90°

(C) 0°  (D) None of these

16. What is the maximum size of a stack in an 8085 microprocessor?

(A) 32 K  (B) 256

(C) Size of RAM  (D) 16 K

17. Which is the longest instruction of 8085 microprocessor?

(A) JMP instruction  (B) CALL instruction

(C) JNZ instruction  (D) LXI H instruction

18. Which logic family is the fastest?

(A) TTL  (B) ECL

(C) NMOS  (D) DTL

19. In I/O mapped I/O scheme the maximum number of input and output devices that can be connected to 8085 is:

(A) 512  (B) 256

(C) 16 K  (D) 64 K
20. Which logic family consumes the least power consumption?
   (A) NMOS  (B) ECL
   (C) CMOS  (D) TTL

21. 8251 is used as:
   (A) Universal synchronous/asynchronous transmitter/receiver
   (B) Programmable parallel port
   (C) DMA controller
   (D) Programmable Interrupt controller

22. Which of the following statements is true?
   (A) SRAM is faster than DRAM and DRAM is used in cache memory
   (B) DRAM is faster than SRAM and DRAM is used in cache memory
   (C) SRAM is faster than DRAM and SRAM is used in cache memory
   (D) DRAM is faster than SRAM and SRAM is used in cache memory

23. Which of the following logic elements is used in the design of a bus architecture?
   (A) Demultiplexer  (B) Encoder
   (C) PROM           (D) Multiplexer
24. Compute the step size of an 8-bit A/D converter with full scale voltage of 5 V.

(A) 0.1  (B) 5 V  
(C) 0.02 V  (D) 0.625

25. BJT can deliver larger current than a MOSFET because:

(A) It is smaller in size than a MOSFET  
(B) It has higher transconductance than a MOSFET  
(C) It has higher output resistance than a MOSFET  
(D) It has lower parasitic capacitances

26. The T input of a Toggle flip-flop is always 1. Its clock frequency is 10 MHz. What is the frequency of the signal available at its Q output?

(A) 20 MHz  (B) 10 MHz  
(C) 5 MHz  (D) Zero

27. How many flip-flops are needed in a 3 state sequential circuit that employs one hot encoding?

(A) 3  (B) 2  
(C) 1  (D) None of these
28. If the $\bar{Q}$ output of a positive edge triggered D flip-flop is connected to its D input. Compute the frequency of its Q-output, if the input clock frequency is 20 kHz.

(A) 10 kHz  
(B) 20 kHz  
(C) 40 kHz  
(D) Zero

29. Which of the following digital blocks is used to generate a clock of the desired frequency from the crystal oscillator?

(A) Decoder  
(B) Shift register  
(C) Counter  
(D) Multiplexer

30. An LTI system with impulse response $h[n] = u[n]$ is:

(A) a non-causal averaging system  
(B) a causal averaging system  
(C) an accumulator that computes sum of all values of the input  
(D) an accumulator that computes the running sum of all values of input up to the present time

31. The impulse response of a system is $h[n] = a^n u[n]$. The condition for the system to be bounded input bounded output stable is:

(A) $a$ is real and positive  
(B) $a$ is real and negative  
(C) $|a| > 1$  
(D) $|a| < 1$
32. For distortionless communication through an LTI system, the phase response of the system should be:

(A) one
(B) zero
(C) constant
(D) a linear function of the frequency

33. For a system with input \( x[n] = \delta[n - 1] \) and impulse response \( h[n] = \delta[n + 1] \), the \( z \)-transform of the output is:

(A) \( z \)  
(B) \( z^{-1} \)  
(C) 0  
(D) 1

34. The frequency response of a system with \( h[n] = \delta[n] - \delta[n - 1] \) is given by:

(A) \( \delta(e^{j\omega}) - \delta(e^{j(\omega-1)}) \)  
(B) \( 1 - e^{j\omega} \)  
(C) \( u(e^{j\omega}) - u(e^{j(\omega-1)}) \)  
(D) \( 1 - e^{-j\omega} \)

35. The Fourier transform of a signal \( x(t) \) is, \( X(f) = 1/j\pi f \), then \( x(t) \) is equal to:

(A) \( u(t) \)  
(B) 1  
(C) \( 1/\pi t \)  
(D) \( 2u(t) - 1 \)
36. The gain margin in db for a unity feedback control system, whose open-loop transfer function is:

\[ G(s) = \frac{1}{s(s+1)}, \]

is given by:

(A) 0  
(B) 1  
(C) −1  
(D) ∞

37. In servo system, the device used for providing derivative feedback is called:

(A) Potentiometer  
(B) Synchro  
(C) Servomotor  
(D) Tacho generator

38. For the open-loop transfer function of a system,

\[ H(s)G(s) = \frac{K(s+10)}{s(s+1)(s+2)}, \]

the breakaway point lies between:

(A) 0 and −1  
(B) −1 and −2  
(C) −2 and −10  
(D) None of these

39. The open loop transfer function of the control system has one pole in the RHS-plane and its Nyquist plot encircles \(-1 + j0\) point twice in the clockwise direction, then the system is:

(A) Unstable  
(B) Stable  
(C) Critically stable  
(D) Conditionally stable
40. $\Phi(t_0, t_1)$, the state transition matrix is equivalent to:

(A) $-\Phi(t_0, t_1)$  
(B) $-\Phi(t_1, t_0)$  
(C) $\Phi^{-1}(t_0, t_1)$  
(D) $\Phi^{-1}(t_1, t_0)$

41. In FM modulation, when the modulation index increases, transmitted power is:

(A) constant  
(B) increased  
(C) decreased  
(D) none of these

42. An earth station transmitter consists of:

(A) RF to IF down converter  
(B) IF to RF converter  
(C) Either (A) or (B)  
(D) None of these

43. The maximum power in AM, when modulation index is:

(A) 0  
(B) 0.5  
(C) 0.7  
(D) 1

44. An AM demodulator can be implemented with a linear multiplier followed by a ................. filter.

(A) low-pass  
(B) high-pass  
(C) band-pass  
(D) band-stop

45. The bandwidth of voice grade channel is approximately:

(A) 4000 Hz  
(B) 5000 Hz  
(C) 6000 Hz  
(D) 3000 Hz
46. A parallel plate capacitor is made of two circular plates separated by a distance of 5 mm and with a dielectric of dielectric constant 2.2 between them. When the electric field in the dielectric is $3 \times 10^4$ V/m, charge density of the positive plate will be close to :

(A) $6 \times 10^4$ C/m$^2$  
(B) $3 \times 10^{-7}$ C/m$^2$

(C) $6 \times 10^{-7}$ C/m$^2$  
(D) $3 \times 10^4$ C/m$^2$

47. A transmission line has characteristic impedance of 50 Ω and length $l = \lambda/8$. If load $Z_L = (R + j30)$ Ω, then the value of R, at which input impedance of transmission will be real, is :

(A) 40 Ω  
(B) 20 Ω

(C) 80 Ω  
(D) None of these

48. The polarization state of the plane wave is :

(A) Circular  
(B) Elliptical

(C) Linear  
(D) Cannot be determined

49. An electromagnetic wave in a hollow rectangular waveguide is characterised by :

(A) TEM wave  
(B) Only TE wave

(C) Only TM wave  
(D) Both TE and TM waves
50. A rectangular wave guide acts as a :
   (A) Low pass filter                (B) High pass filter
   (C) Band pass filter              (D) Band stop filter

51. During measurement of voltage and current in a load, if voltmeter and ammeter are interchanged by mistake, then :
   (A) Voltmeter will burn            (B) Ammeter will burn
   (C) Both meters will burn          (D) None will burn

52. Which instrument is free from stray magnetic fields ?
   (A) MI attraction type             (B) MI repulsion type
   (C) Thermal type                   (D) PMMC type

53. Which type of damping is generally preferred in case of instruments having weak magnetic fields ?
   (A) Air friction damping           (B) Fluid friction damping
   (C) Eddy current damping           (D) None of these

54. LVDT is always used as :
   (A) Primary transducer             (B) Secondary transducer
   (C) Temperature compensator         (D) Signal generator
55. A bridge used for the measurement of loss angle of a capacitor is:

(A) Maxwell’s  
(B) Schering’s

(C) Anderson’s  
(D) Hay’s

56. Photoelectric transducer is used for the measurement of:

(A) Current  
(B) Temperature

(C) Pressure  
(D) Displacement

57. Temperature inside a boiler furnace can be measured by:

(A) Mercury thermometer  
(B) Bimetallic thermometer

(C) Liquid hydrogen thermometer  
(D) Optical pyrometer

58. Wagner’s earth device is used in a.c. bridges for:

(A) Eliminating the effect of earth capacitances  
(B) Eliminating the effect of inter-component capacitances

(C) Eliminating the effect of stray electrostatic fields  
(D) Shielding the bridge elements
56. Which of the following is not a transducer?

(A) Strain gage  (B) Potentiometer
(C) Thermocouple  (D) None of these

60. Semiconductor strain gages have:

(A) Low fatigue  (B) High gage factor
(C) Linearity  (D) Poor hysteresis

61. The principle of operation of Direct connection Q-meter is based on:

(A) Self inductance  (B) Series resonance
(C) Mutual inductance  (D) Parallel resonance

62. Which bridge can only be used for high Q-inductance measurement?

(A) Anderson  (B) Wien
(C) Schering  (D) Hay

63. High resistance with high accuracy can be measured by:

(A) Kelvin’s double arm bridge  (B) Wheatstone’s bridge
(C) Ammeter-Voltmeter  (D) Price guard wire method
64. A Hall effect transducer can be used for measurement of:

(A) Pressure  (B) Temperature
(C) Displacement  (D) Strain

65. For fiber optical sensors:

(A) Single mode transmission is used
(B) Multimode transmission is used
(C) Both single and multimode transmission is used
(D) Not related to mode of transmission

66. In a digital frequency meter, the Schmitt trigger is used for:

(A) Converting sinusoidal waveform into rectangular pulses
(B) Scaling of sinusoidal waveform
(C) Providing time base
(D) None of the above

67. A digital linear displacement transducer normally uses:

(A) Straight binary code  (B) BCD
(C) Octal code  (D) Hexadecimal code

68. Which one of the following display devices consumes minimum power?

(A) Based upon LED  (B) Based upon LCD
(C) Based upon CRT  (D) Based upon Nixie tube
69. For the recording of very fast random signals which one of the following instruments will be most successful?

(A) Dual trace 40 MHz CRO
(B) Sampling oscilloscope
(C) Real time spectrum analyzer
(D) Scanning type spectrum analyzer

70. Which one of the following transducers is used for accurate and precise measurement of temperature?

(A) Thermistor
(B) Thermocouple (Alumel/Chromel)
(C) Semiconductor temperature chip
(D) Platinum resistance thermometer

71. True RMS value Voltmeter is ideal for the determination of RMS value due to which one of the following reasons?

(A) It employs two thermocouples
(B) It employs high gain amplifier
(C) It employs two heaters which are heated by direct current and alternating current
(D) It employs feedback
72. Microprocessor is used in instrumentation due to which one of the following reasons?

(A) It provides precision which is not possible in analog system
(B) It is very easy to design and operate
(C) A multifunctional flexible system is possible
(D) It is easy to interface

73. Which one of the following primary sensors can work as absolute device for the measurement of differential pressure?

(A) Diaphragm with strain gauge    (B) U-tube manometer
(C) Bourdon tube                  (D) Bellows

74. For accurate and precise measurement of speed of small motors which one of the following is most suitable?

(A) Capacitive transducer         (B) Tachometer
(C) Inductive pickups             (D) Contact type digital encoder

75. Rectifier instruments indicate:

(A) RMS value                     (B) Peak value
(C) Average value                 (D) None of these

76. If instrument is to have wide range, the instrument should have:

(A) Linear scale                  (B) Square law scale
(C) Exponential scale             (D) Logarithmic scale
77. The optical sensors may be classified as:
   (A) Intensity and intrinsic types  (B) Interferometric and extrinsic types
   (C) Intrinsic and extrinsic types  (D) All of these

78. Which one of the following materials is used as moving iron piece in a moving iron instrument?
   (A) Hard magnetic material
   (B) Soft magnetic material in laminated form
   (C) Soft magnetic material in solid shape
   (D) Diamagnetic material

79. On account of the effect of inductance in pressure coil, the dynamometer type Wattmeter at lagging power factor tends to read:
   (A) Low  (B) High
   (C) Erratically  (D) Normally

80. The resolution of a digital ammeter with 4-digit display is:
   (A) 1/10000  (B) 1/1000
   (C) 1/4  (D) 1/2

81. What was the total fruit production in H.P. during 2013-14 (in lakh metric tons) ?
   (A) 7.23  (B) 7.89
   (C) 8.44  (D) 8.64

LECT. (INST. ENGG.) T.E.-2016 19  P.T.O.
82. Which one of the following is placed in H.P. on priority under Bharat Nirman Programme?  
(A) Rural Water Supply  
(B) Rural literacy  
(C) Rural skill development  
(D) Rural health  

83. How many Kisan Credit Cards have been distributed in H.P. upto September, 2014?  
(A) 652463  
(B) 648272  
(C) 647292  
(D) 643355  

84. How many veterinary dispensaries have been opened in H.P. upto December, 2014 under Mukhyamantri Arogya Pashudhan Yojna?  
(A) 1251  
(B) 1362  
(C) 1419  
(D) 1560  

85. When was H.P. Administrative Tribunal first set up?  
(A) 1985  
(B) 1986  
(C) 1987  
(D) 1988  

86. Which raja of Nurpur was sent by Shah Jahan to fight against Usbega of Balakh?  
(A) Rajender Singh  
(B) Jagat Singh  
(C) Basu Singh  
(D) Mandhata
87. Who opined in his book Vedic India that there was probably a large Dravidian element in the aboriginal population in the hills?
   (A) Vincent Smith            (B) E.J. Rapson
   (C) G.T. Vigue             (D) W. Crooks

88. When was Himachal Pradesh made a 'Part-C' State of the Indian Union?
   (A) 1948                    (B) 1949
   (C) 1951                    (D) 1952

89. From which source are Kangra paintings mainly drawn?
   (A) Jai Deva's Gita Gobind
   (B) Bihari's Satsai
   (C) Keshav Dass' Rasik Priya
   (D) All of the above

90. Who is the author of Polyandry in the Himalayas?
   (A) Moorcraft             (B) Y.S. Parmer
   (C) O.C. Handa           (D) Rahul Sanskritayan

91. Persons of which age-group are eligible under the Pradhan Mantri Suraksha Bima Yojna?
   (A) 18-70 years          (B) 18-75 years
   (C) 20-65 years          (D) 25-70 years
92. Who is Pradip Baijal?
   (A) a film producer
   (B) former TRAI Chief
   (C) former Coal Secretary, Govt of India
   (D) former CBI Director

93. To which state of India does Uralis Tribe belong?
   (A) Kerala
   (B) Andamans
   (C) Nicobar
   (D) Sikkim

94. By which constitutional amendment was Dogri language included in the 8th Schedule of the Indian Constitution?
   (A) Seventy-first (71)
   (B) Eighty-third (83)
   (C) Eighty-seventh (87)
   (D) Ninety-second (92)

95. How many members are there in the Press Council of India?
   (A) 12
   (B) 18
   (C) 25
   (D) 28

96. Which Chair was Christopher Alan Bayle holding at the University of Chicago in 2014-15?
   (A) Dayananda Professor
   (B) Vivekananda Professor
   (C) Aurobindo Ghosh Professor
   (D) Mahatma Gandhi Professor
97. The race horse presented to PM Narendra Modi during his visit to Mangolia has been named Kanthaka. The name is associated with ..................

(A) Shivaji    (B) Chandragupta Maurya

(C) Tipu Sultan (D) Gautam Buddha

98. Which one of the following that were destroyed/damaged during the April, 2015 earthquake in Nepal was the oldest?

(A) Dharahara Tower    (B) Basantpur Place

(C) Durbar Squares    (D) Kashtha Mandap

99. What award was given to Mazen Darwish (Syrian Journalist) in May, 2015?

(A) Freedom of Expression Award by PEN Centre (USA)

(B) UNESCO's Press Freedom Award

(C) Natural History Award (USA)

(D) Charlie Hebdo Award (France)

100. Between which two places is Solar Plane's Marathon Pacific Flight taking place?

(A) Beijing and Alaska    (B) Tokyo and Ottawa

(C) Nanjing and Hawaii    (D) Seol and Solomon Islands