74/26

Question Booklet Alpha Code

A

Question Booklet Sl. No.

A

Total Number of Questions : 100 **Time : 90 Minutes**

Maximum Marks : 100

INSTRUCTIONS TO CANDIDATES

1. The Question Paper will be given in the form of a Question Booklet. There will be four versions of Question Booklets with Question Booklet Alpha Code viz. **A, B, C** & **D**.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the Question Booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a Question Booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your Question Booklet is un-numbered, please get it replaced by new Question Booklet with same alpha code.
6. The Question Booklet will be sealed at the middle of the right margin. Candidate should not open the Question Booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the Question Booklet supplied to him/her contains all the 100 questions in serial order. The Question Booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the Question Booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices **(A), (B), (C)** and **(D)** having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

A

1. The distance between two magnetic poles is doubled and their pole strengths are also doubled. The force between them is
   A) Increases four times
   B) Remains unchanged
   C) Decreases four times
   D) Increases two times

2. The strength of an electromagnet is determined by
   A) Current
   B) Core material
   C) Number of turns
   D) All of the above

3. A capacitor of 10 μF charged to 400 V is connected in parallel with another capacitor of 5 μF capacitance and charged to 100 V. The common potential is
   A) 300 V B) 500 V C) 250 V D) 400 V

4. When the relative permeability of a material is much greater than one, it is
   A) Diamagnetic
   B) Paramagnetic
   C) Ferromagnetic
   D) None of the above

5. A resistor of 6 Ω is connected in series with parallel combination of a number of resistors, each of 6 Ω. If the total resistance of the circuit is 7 Ω. The number of resistors in parallel is
   A) 6 Ω B) 5 Ω C) 12 Ω D) 8 Ω

6. In any electrical network, the algebraic sum of the currents meeting at a point is zero. The statement is associated with
   A) Ohm's law
   B) Kirchhoff's Mesh law
   C) Lenz's law
   D) Kirchhoff's current law

7. A circuit has inductance of 3 H. If the circuit current changes at the rate of 15 A /second. Then self induced e.m.f. is
   A) 5 V B) 45 V C) 15 V D) 0.2 V

8. A heater coil rated at 1000 W 200 V is connected to 100 V. Power consumed is
   A) 1000 W B) 500 W C) 250 W D) 40 W

9. A conductor of length 2 meter moves at right angle to a uniform magnetic field of flux density 1.2 Weber/meter square with a velocity of 30 meter/second. The induced e.m.f. when the conductor moves at an angle of 30 degree to the direction of field is
   A) 60 V B) 72 V C) 25 V D) 36 V

10. A capacitor opposes
    A) Change in current
    B) Change in voltage
    C) Both A) and B)
    D) None of the above

11. The input AC supply commonly used in a regulated power supply is
    A) 110 V, 60 Hz B) 230 V, 50 Hz C) 12 V, 50 Hz D) 24 V, 60 Hz

12. LVDT is used to measure
    A) Pressure B) Temperature
    C) Linear displacement D) Humidity

13. The basic blocks of a DC power supplies are
    A) Transformer, Rectifier, Filter, Regulator
    B) Oscillator, Amplifier, Filter
    C) Generator, Transformer, Rectifier
    D) None of these

14. A fuse protects against
    A) Over voltage B) Over current
    C) Frequency change D) Ripple

15. For proper transistor operation, the Emitter-Base junction should be _____ and the Collector-Base junction to be _____.
    A) Reverse biased and Forward biased B) Forward biased and Reverse biased
    C) Unbiased and Biased D) Open-circuited and Short-circuited

16. Thermal runaway is mainly caused by
    A) Low current gain B) Increase in temperature
    C) Low supply voltage D) High load resistance

17. The main purpose of an optocoupler is
    A) Amplification B) Isolation C) Rectification D) Oscillation

18. Heat in induction heating is produced by
    A) Eddy currents B) Magnetic field only
    C) Electrostatic field D) Solar energy

19. Biasing sets the transistor operating point near the middle of the
    A) Transfer curve B) Input characteristic
    C) DC load line D) Output waveform

20. Online UPS provides
    A) Transfer delay B) Zero transfer time
    C) High ripple D) Low reliability

21. What tool is used to check if a circuit is energized without making physical contact with the wire ?
    A) Screwdriver
    B) Non-contact voltage tester
    C) Metal ruler
    D) Pliers

22. What does the “Lockout/Tagout” (LOTO) safety procedure prevent ?
    A) Overcharging of industrial backup systems
    B) Accidental re-energization of equipment under repair
    C) Theft of valuable electrical copper wiring
    D) Voltage drops during peak utility hours

23. In a purely capacitive circuit, the alternating voltage _____ the alternating current by 90°.
    A) lags B) leads C) in phase D) out of phase

24. What is the immediate primary consequence of connecting two batteries with different voltage ratings in parallel ?
    A) The total voltage of the system doubles, while the total capacity remains the same as the smaller battery
    B) Both batteries automatically stop discharging due to internal protective circuitry, maintaining their original independent voltages perfectly
    C) A massive circulating loop current flows from the higher-voltage battery into the lower-voltage battery, causing severe overheating and risk of damage
    D) The lower-voltage battery instantly matches the voltage of the higher-voltage battery without any transfer of current or heat generation

25. An electric scooter needs a 36 V battery pack using standard 3.6 V lithium-ion cells. Each cell has a capacity of 2.5Ah. If the scooter requires a total pack capacity of 10Ah, what is the exact total number of individual cells needed to build this pack ?
    A) 10 cells B) 20 cells C) 30 cells D) 40 cells

26. If a sinusoidal AC voltage has a peak value of 100 V, what is its approximate Root-Mean-Square (RMS) voltage ?
    A) 50.0 V B) 63.7 V C) 70.7 V D) 141.4 V

27. For the AC voltage wave v = 200 sin(314 t), what is the average voltage evaluated over a single half-cycle ?
    A) 127.4 V B) 140 V C) 141.4 V D) 173.2 V

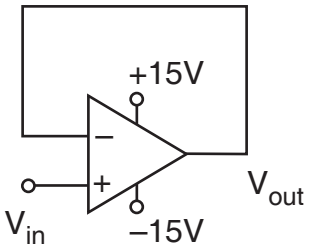
28. A balanced Delta load has an impedance of 10 Ω per phase and is connected to a 3-phase line voltage of 200 V. What is the Line current ?
    A) 20 A B) 15.87 A C) 10.54 A D) 34.64 A

29. For a waveform, the RMS voltage is 12 V and the half-cycle average voltage is 9 V. What is the form factor of this specific waveform ?
A) 1.11 B) 1.33 C) 1.5 D) 1.66

30. A capacitive reactance of 10 Ω is operating on a 50 Hz system line. If the line frequency changes to 100 Hz, what is the new capacitive reactance value ?
A) 5Ω B) 10Ω C) 20Ω D) 50Ω

31. The slew rate of an operational amplifier is defined as the
A) Highest frequency at which the output can change without distortion
B) The maximum rate of change of the output voltage with respect to time
C) The smallest rate of change of input voltage with respect to time
D) The ratio of output voltage to input voltage

32. Find the output voltage (V_{out}) when the input voltage (V_{in}) is 2V.



A) + 15V B) – 15V C) 0V D) 2V

33. The output of an OPAMP differentiator circuit for a sine wave input is
A) Square B) Cosine C) Triangular D) Pulse

34. Which of the following is an application of a Schmitt trigger circuit ?
A) Converting an irregular shaped waveform into a square waveform
B) Amplifying low-level signals
C) Filtering unwanted noise from a signal
D) Rectifying Alternating Current (AC) signals

35. How many comparators are required for a flash-type Analog-to-Digital Converter (ADC) ?
A) 4 B) 16 C) 15 D) None of these

36. In a Phase-Locked Loop (PLL), the range of frequencies over which the PLL can maintain lock with the incoming signal is called
A) Pull up range B) Capture range
C) Lock range D) Free running frequency

37. Identify the 555-timer pin that should be connected to power supply ($+V_{cc}$) when left unused to maintain normal operation.
    A) Trigger B) Reset C) Control Voltage D) Threshold

38. Which principle specifies the necessary condition for sustained oscillations in a linear sinusoidal oscillator ?
    A) Barkhausen criterion B) Electroluminescence
    C) Seebeck effect D) Photoelectric effect

39. Which of the following is a non-sinusoidal oscillator ?
    A) RC Phase Shift oscillator B) Astable Multivibrator
    C) Wien Bridge oscillator D) Hartley oscillator

40. Among the following, which oscillator has the greatest frequency stability ?
    A) Clapp oscillator B) Wien Bridge oscillator
    C) Crystal oscillator D) Colpitts oscillator

41. In a full wave rectifier circuit, what is the primary purpose of adding a capacitor filter across the output load ?
    A) To increase the peak inverse voltage of the diodes
    B) To step down the input AC voltage before rectification
    C) To block the flow of direct current to the load
    D) To reduce the ripple factor and smooth out the pulsating DC output

42. Which power electronic device is structurally equivalent to two SCR connected in inverse parallel, making it ideal for AC power control ?
    A) UJT B) IGBT C) Triac D) Diac

43. Which protective device detects leakage current and disconnects the supply ?
    A) MCB B) RCCB C) Contactor D) Fuse wire

44. An SCR can be turned on by
    A) Reducing anode voltage to zero
    B) Applying a gate pulse while forward biased
    C) Reversing the cathode polarity
    D) Removing load resistance

45. In a UJT relaxation oscillator, the frequency of oscillation mainly depends upon
    A) Charging resistance and capacitor values
    B) Transformer turns ratio
    C) Load current only
    D) Supply frequency only

46. Two identical diodes are used in a center tapped full wave rectifier. If one diode becomes open circuited, the output will behave like
    A) A bridge rectifier
    B) A regulated DC supply
    C) A half wave rectifier
    D) An inverter

47. In a plate earthing system, adding water around the earth pit mainly helps to
    A) Increase earth resistance
    B) Decrease soil conductivity
    C) Improve conductivity between electrode and soil
    D) Reduce fault current flowing to earth

48. An electric iron and a water heater cause the fuse to blow whenever they are operated simultaneously. The most likely reason is
    A) Low power factor
    B) Circuit overload
    C) Earth leakage
    D) Reverse polarity

49. A DPST switch is commonly used when it is necessary to
    A) Control two circuits independently
    B) Operate a circuit from two locations
    C) Provide overload protection to a circuit
    D) Disconnect both phase and neutral simultaneously

50. An IGBT is selected instead of an SCR for a high frequency switching application mainly because
    A) IGBTs can be switched ON and OFF more easily by control signals
    B) IGBTs require no gate terminal
    C) IGBTs work only with DC
    D) IGBTs do not generate heat

51. Convert hexadecimal number 2A2 to decimal number.
    A) 2102 B) 674 C) 1242 D) 672

52. The 5 bit Gray code representation of the binary 10111 is
    A) 00010 B) 11011 C) 11100 D) 10100

53. The Boolean function A+BC is a reduced form of
    A) (A+B).(A+C) B) AB+BC C) (A+C)B D) (A+B)C

54. The Carry flag (CY) is located at which exact bit position inside the Program Status Word register ?
    A) PSW.7 B) PSW.8 C) PSW.0 D) PSW.1

55. Why are Schottky transistor preferred over normal bipolar transistors in digital logic circuits like TTL ?

A) They have higher storage time

B) They increase breakdown voltage

C) They have lower power dissipation

D) They completely eliminate saturation delay time by preventing deep saturation

56. How many address lines and data lines are required for a memory chip designed as $4K \times 16$?

A) 16 address lines, 4 data lines

B) 10 address lines, 16 data lines

C) 12 address lines, 16 data lines

D) 12 address lines, 4 data lines

57. A flip flop has its input T tied steadily to logic 1. If a continuous clock signal with a frequency of f is applied, what will be the frequency of the output signal at Q ?

A) f B) 2f C) f/4 D) f/2

58. A digital design requires a 3 input AND gate, but only 2 input NAND gates are available in the inventory. What is the minimum number of 2 input NAND gates required to build this 3 input AND gates logic function ?

A) 6 B) 5 C) 4 D) 3

59. Why does a standard SRAM cell maintain its data state indefinitely as long as power is applied without requiring any refresh operations ?

A) The word line decoder continuously loops through all addresses automatically at hardware speed

B) It utilizes thick ferromagnetic thin films that store bits as stable magnetic fields

C) The internal capacitors are engineered with an infinitely high dielectric isolation constant

D) It uses a cross-coupled inverter latch structure that provides continuous regenerative feedback to lock the state

60. A digital designer interfaces a 5 V CMOS gate to drive a standard 5 V TTL gate. The voltage specifications are follows :

CMOS : $V_{OH\ (min)} = 4.4$ V, $V_{OL\ (max)} = 0.3$ V,

TTL : $V_{IH\ (min)} = 2.0$ V, $V_{IL(max)} = 0.8$ V.

What is the low level noise margin V_{NL} for this interfacing configuration ?

A) 1.2 V B) 0.5 V C) 2.4 V D) 1.1 V

61. If the armature winding of an Alternator is short-pitched by an angle of 30° the Pitch factors is

A) 0.5 B) 0.9659 C) $\frac{\sqrt{3}}{2}$ D) 1

62. In the Torque (T) v/s slip (s) characteristics of a Three phase induction motor, the unstable region is where

A) $T \propto \frac{1}{s}$ B) $T \propto s$

C) T is maximum D) There is no unstable region

63. Kramer system of speed control is used only for

A) Squirrel cage induction motor B) Synchronous motor

C) Slip ring induction motor D) DC shunt motor

64. For the rotor of a Double-cage induction motor

A) The inner cage has high resistance and high inductance

B) The outer cage has high resistance and high inductance

C) The inner cage has high resistance and low inductance

D) The outer cage has high resistance and low inductance

65. Property of ferromagnetic materials to change its shape or dimensions when it is subjected to cycle of magnetization is called

A) Electrostriction B) Piezoelectricity

C) Magnetostriction D) Piezomagnetism

66. The critical field resistance in a DC shunt motor is

A) Maximum field circuit resistance above which the generator fails to self-excite and build up voltage

B) Maximum field circuit resistance below which the generator fails to self-excite and build up voltage

C) Minimum field circuit resistance below which the generator fails to self-excite and build up voltage

D) None of the above

67. The fact that a single-phase induction motor is not self-starting can be well demonstrated by

A) Two Reactance Theory

B) Double Revolving Field Theory

C) Transient and Sub-transient Reactance Theory

D) None of the above

68. The maximum load torque a synchronous motor can develop at rated voltage and frequency without losing synchronism is
    A) Pull-in torque
    B) Running torque
    C) Starting torque
    D) Pull-out torque

69. When a 3 phase alternator is synchronized with existing busbar using three dark lamp method, the higher flickering frequency of the lamps indicates
    A) Frequency of busbar is higher than frequency of incoming alternator
    B) Frequency of busbar is lower than frequency of incoming alternator
    C) The difference in frequency of busbar and the incoming alternator is higher
    D) The flickering frequency of the lamps are independent of the frequency of busbar and alternator

70. When ideal transformer is on no-load the angle between primary current and input voltage phasors is
    A) Very small angle around 10°
    B) Very large angle around 80°
    C) 90°
    D) None of these

71. A specific colour is represented by the primary colour voltages: Red = 0.7 volts, Green = 0.2 volts and Blue = 0.5 volts. Which of the following statements is correct regarding this colour ?
    A) The white light content is determined by Red = 0.7 volts and the luminance signal is 0.878 volts
    B) The white light content is determined by Green = 0.2 volts and the luminance signal is 0.878 volts
    C) The white light content is determined by Red = 0.7 volts and the luminance signal is 0.383 volts
    D) The white light content is determined by Green = 0.2 volts and the luminance signal is 0.383 volts

72. Consider the following statements regarding colour picture tubes :
    I. Delta-gun picture tube employs three separate electron guns, one for each colour signal. The guns are positioned at the vertices of an equilateral triangle and are tilted inward toward the tube axis.
    II. A Trinitron picture tube employs a single electron-gun assembly with three in-line cathodes and the phosphors on the screen are arranged as vertical strips.

    Which of the following is correct ?
    A) Both statements I and II are correct
    B) Statement I is correct, but statement II is incorrect
    C) Statement II is correct, but statement I is incorrect
    D) Both statements I and II are incorrect

73. In a PAL-D colour television receiver, which of the following statements correctly describes the nature of the signals present at the outputs of the adder and subtractor matrix circuits ?
    A) The adder always produces + 2jV, while the subtractor output alternates between + 2U and – 2U
    B) The adder consistently produces 2U, while the subtractor output alternates in polarity between + 2jV and – 2jV on successive lines
    C) The adder output alternates in polarity (± 2U) on successive lines, while the subtractor output consistently produces 2jV
    D) Both the adder and subtractor outputs alternate signs (± 2U and ± 2jV) on successive lines

74. Which of the following correctly represents the signal flow in a satellite television receiving system from transmission to display ?
    A) Satellite → LNB → Dish antenna → Set top box → Television
    B) Satellite → Dish antenna → LNB → Set top box → Television
    C) Satellite → Dish antenna → Set top box → LNB → Television
    D) Satellite → Set top box → Dish antenna → LNB → Television

75. Which of the following correctly differentiates MATV and CATV systems based on their typical area of coverage ?
    A) MATV serves an entire community, whereas CATV serves a single building
    B) MATV networks are bounded by regional city limits, whereas CATV networks are restricted to single property boundaries
    C) MATV serves a building complex, whereas CATV serves a large subscriber community
    D) MATV networks deliver signals strictly across regional industrial zones, whereas CATV networks are confined to compact corporate offices

76. Consider the following statements regarding modulation :
    I. In amplitude modulation, the rate at which the carrier amplitude varies is determined by the frequency of the modulating signal.
    II. In frequency modulation, the rate at which the carrier frequency varies is determined by the frequency of the modulating signal.

    Which of the following is correct ?
    A) Both statements I and II are incorrect
    B) Statement I is correct, but statement II is incorrect
    C) Statement I is incorrect, but statement II is correct
    D) Both statements I and II are correct

77. In a Frequency Modulation system, a 500 Hz modulating signal with an amplitude of 1.6 V produces a modulation index of 50. If the modulating frequency drops to 200 Hz and the amplitude increases to 3.2 V, the resulting maximum frequency deviation and the new modulation index are respectively

A) 50 kHz and 125
B) 25 kHz and 125
C) 50 kHz and 250
D) 25 kHz and 250

78. Fill in the blanks with the correct option :

The signal obtained by sampling a continuous analog waveform is represented using _____. If these samples are further quantized and encoded into a binary digital bit stream, the system is referred to as _____.

A) Pulse Width Modulation; Delta Modulation
B) Pulse Amplitude Modulation; Pulse Code Modulation
C) Pulse Position Modulation; Frequency Shift Keying
D) Amplitude Shift Keying; Differential PCM

79. Consider the following statements.

I. Thermal noise is caused by the random vibration of charge carriers as a function of temperature.
II. Shot noise disappears when a steady DC current is established in a device.
III. Transit time noise is negligible at low frequencies and becomes significant at high frequencies.

Which of the following is true about these statements ?

A) Only I is true
B) Only I and II are true
C) Only I and III are true
D) All of the statements I, II and III are true

80. Which of the following statements best defines the radiation resistance of an antenna ?

A) It is the resistance of the antenna conductor that causes power loss in the form of heat
B) It is the resistance offered by the antenna to the flow of electromagnetic waves in free space
C) It represents the total opposition offered by the antenna to alternating current at its input terminals
D) It is an equivalent resistance that would dissipate the same amount of power as that radiated by the antenna

81. Energy meter is an example of

A) Indicating instrument
B) Recording instrument
C) Integrating instrument
D) Absolute instrument

82. Three-phase power can be measured using
A) One wattmeter method B) Two wattmeter method
C) Three wattmeter method D) All of the above

83. The essential elements of an electronic instrument are
A) Transducer B) Signal conditioner
C) Indicating device D) All of the above

84. TOD meter stands for
A) Time of Day meter B) Total Demand meter
C) Transformer Open Detector D) Transformer Overload Detector

85. Find the multiplying factor of a shunt of 500 ohm resistance used with ammeter of 1500 ohm resistance.
A) 2 B) 3 C) 4 D) 1.33

86. Dual Trace CRO uses
A) One beam B) Two beams C) Three beams D) Four beams

87. A triangle waveshape is obtained by
A) By differentiating a sine wave B) By Integrating a square wave
C) By Integrating a sine wave D) By differentiating a square wave

88. Which parameter is critical for avoiding aliasing in data acquisition ?
A) Gain of the amplifier B) Number of bits in ADC
C) Proper sampling rate D) Type of sensor used

89. Current Transformer (CT) is used to
A) Step down high current B) Step down voltage
C) Measure power directly D) Step up low current

90. Synchroscope is used for
A) Measuring power B) Synchronizing two alternators
C) Measuring insulation resistance D) Measuring energy

91. What is the bit size of the DPTR register in the 8051 microcontroller ?
A) 4 bits B) 8 bits C) 16 bits D) 32 bits

92. Which of the following is the general-purpose of RAM area in 8051 microcontroller ?
A) 30H to 7FH B) 20H to 2FH C) 18H to 1FH D) 10H to 17H

93. Which flag in the PSW register of 8051 is set when a carry is generated from bit 3 to bit 4 during an arithmetic operation ?
A) P B) OV C) CY D) AC

94. An 8051 microcontroller has its $\overline{EA}$ pin tied to ground. During an instruction fetch, from which memory space will the microcontroller retrieve the opcode ?
A) Internal RAM only
B) External ROM only
C) Internal ROM only
D) Internal ROM first, then switches to external ROM

95. Which type of output latch is associated with each port pin of 8051 ?
A) T Latch B) SR Latch C) D Latch D) Gated SR Latch

96. In an 8051 microcontroller, how the Timer 1 functions when it is programmed to operate in Mode 3 ?
A) It functions as a 16-bit timer
B) It functions as an 8-bit auto reload counter
C) It holds its count and stops counting
D) It splits into two independent 8-bit timers

97. The crystal frequency of an 8051 microcontroller is 12MHz. What will be the baud rate if the serial port is configured to operate in Mode 0 ?
A) 500 Kbps B) 1 Mbps C) 6 Mbps D) 375 Kbps

98. Which of the following 'instruction – addressing mode' combination is correct ?
A) MOV A,#05h – Register addressing mode
B) MOV R5,A – Direct addressing mode
C) MOV A,70h – Immediate addressing mode
D) MOV A,@R0 – Indirect addressing mode

99. Which register in 8051 microcontroller does not have an internal address ?
A) DPTR B) PC C) A register D) SP

100. Immediately following a hardware reset, what value is automatically loaded into the 8051 port latches ?
A) FFH B) 07H C) 00H D) 11H

Space for Rough Work