

MIZORAM PUBLIC SERVICE COMMISSION

**TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO
JUNIOR ENGINEER (J.E) CONTRACT BASIS
UNDER RURAL DEVELOPMENT DEPARTMENT, NOVEMBER, 2016.**

**ELECTRONICS & COMMUNICATION ENGINEERING
PAPER - I**

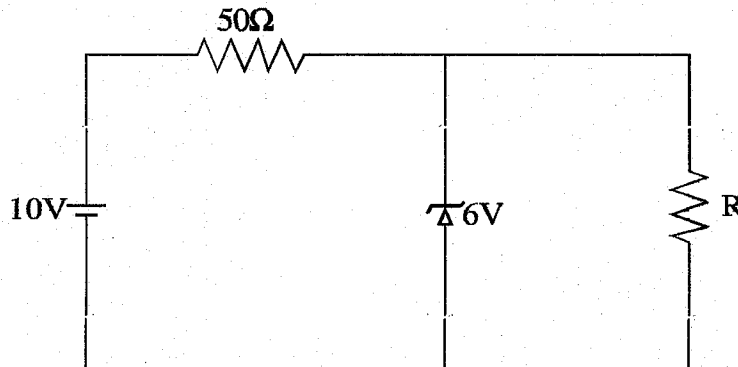
Time Allowed : 2 hours

Full Marks : 150

All questions carry equal marks of 2 each.

Attempt all questions

1. In a P-type silicon sample, the hole concentration is $2.25 \times 10^{15}/\text{cm}^3$. If the intrinsic carrier concentration is $1.5 \times 10^{10}/\text{cm}^3$, the electron concentration is
 - (a) Zero
 - (b) $10^{10}/\text{cm}^3$
 - (c) $10^5/\text{cm}^3$
 - (d) $1.5 \times 10^{25}/\text{cm}^3$
2. The 6V Zener diode shown in the figure, has zero Zener resistance and a knee current of 5mA. What is the minimum value of R so that the voltage across it does not fall below 6V?



- (a) $1.2\text{K}\Omega$
 - (b) 80Ω
 - (c) 50Ω
 - (d) 0Ω
3. The depletion region of a P-N junction is one that is depleted of
 - (a) Immobile charges
 - (b) Mobile charges
 - (c) Atoms
 - (d) None of the these
 4. A BJT has a base current of $200\mu\text{A}$ and emitter current of 200mA . Collector current & β is
 - (a) 50mA & 100
 - (b) 19.8mA & 99
 - (c) 19.8mA & 100
 - (d) 50mA & 99
 5. An n-channel JFET has $I_{\text{DSS}} = 2\text{mA}$ and $V_{\text{P}} = -4\text{V}$. Its maximum transconductance is
 - (a) 1 milli mho
 - (b) 0.5 milli mho
 - (c) 5 milli mho
 - (d) 0.1 milli mho
 6. The temperature co-efficient of an intrinsic semiconductor is
 - (a) Zero
 - (b) Positive
 - (c) Negative
 - (d) Infinite

7. The peak inverse voltage (PIV) is applied across a diode when it is
 - (a) Forward biased
 - (b) Reverse biased
 - (c) On a heat sink
 - (d) ON
8. In a CB amplifier maximum efficiency is
 - (a) 99%
 - (b) 85%
 - (c) 50%
 - (d) 25%
9. A Darlington circuit is obtained by connecting
 - (a) Two CB stages in cascade
 - (b) Two CE stages in cascade
 - (c) A CE stage followed by CB stage
 - (d) Two emitter follower in cascade
10. Which of the following combination has no phase inversion of input signal
 - (a) CE & CC stages
 - (b) CE stage & emitter follower
 - (c) Two CE stages
 - (d) Three CE stages
11. An ideal voltage amplifier should have
 - (a) Low input impedance & high output impedance
 - (b) High input impedance & low output impedance
 - (c) High input impedance & high output impedance
 - (d) Low input impedance & low output impedance
12. In a high frequency region, an amplifier behaves like a
 - (a) High pass filter
 - (b) Low pass filter
 - (c) Band pass filter
 - (d) Band reject filter
13. When power level of an amplifier is changed from 10W to 20 W, equivalent dB gain will be
 - (a) 3 dB
 - (b) 30 dB
 - (c) 10 dB
 - (d) 20 dB
14. The best value of rectification efficiency for a half wave rectifier could be around
 - (a) 40%
 - (b) 50%
 - (c) 90%
 - (d) 85%
15. Charge carrier movement resulting from an initial concentration charge carriers is known as
 - (a) Carrier current
 - (b) Charge current
 - (c) Drift current
 - (d) Diffusion current
16. The type of oscillator used in simple radio receivers is
 - (a) Wein bridge
 - (b) Phase shift
 - (c) Colpitts
 - (d) Hartley
17. Which semiconductor device acts like a diode & two resistors?
 - (a) UJT
 - (b) SCR
 - (c) Diac
 - (d) Triac
18. The collector current increasing with V_{CE} indicates that the transistor is in
 - (a) Inverted mode region
 - (b) Saturation region
 - (c) Cut off region
 - (d) Active region
19. Pinch off region is similar to
 - (a) Cut off region
 - (b) Saturation region of BJT
 - (c) Active region of BJT
 - (d) None of these

20. The frequency of oscillation in case of RC phase shift oscillator is given as

- (a) $\frac{2}{\pi\sqrt{RC}}$ (b) $\frac{1}{2\pi\sqrt{RC}}$
(c) $2\pi\sqrt{RC}$ (d) $\frac{1}{\pi R\sqrt{C}}$

21. What is the octal equivalent of the binary number 10111101

- (a) 675 (b) 275
(c) 572 (d) 573

22. How is a J-K flip flop made to toggle?

- (a) J=0, K=0 (b) J=1, K=0
(c) J=0, K=1 (d) J=1, K=1

23. Which stack is used in 8085?

- (a) FIFO (b) LIFO
(c) FILO (d) LILO

24. Address line for TRAP is?

- (a) 0023H (b) 0024H
(c) 0033H (d) 0011H

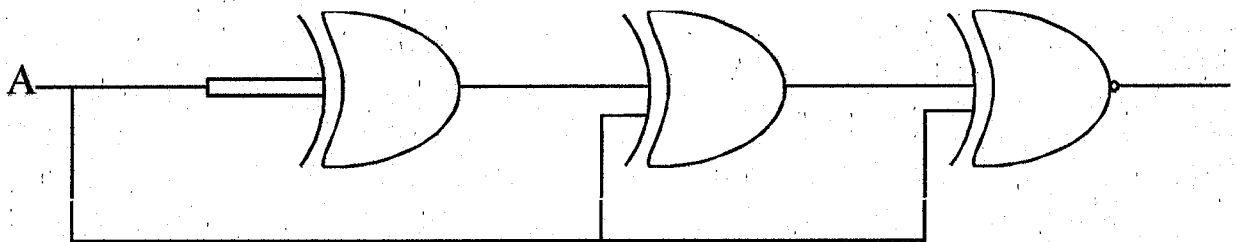
25. What is meant by parallel loading of the register?

- (a) Shifting the data in all flip-flops simultaneously
(b) Loading data in two of the flip-flops.
(c) Loading data in all flip-flops at the same time.
(d) Momentarily disabling the synchronous SET and RESET inputs.

26. The synchronization between microprocessor and memory is done by

- (a) ALE signal (b) HOLD signal
(c) READY signal (d) None of these

27. The output of the following circuit is



- (a) 0 (b) 1
(c) A (d) \bar{A}

28. The full subtractor can be implemented by using

- (a) 3 to 8 line decoder only (b) 3 to 8 line decoder and one OR gate
(c) 3 to 8 line decoder and two OR gate (d) None of these

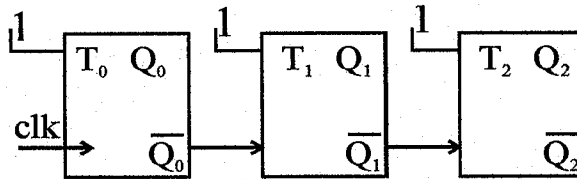
29. A 2 bit synchronous counter uses flip-flops with propagation delay of 25ns each. The maximum possible time required for change of state will be

- (a) 25ns (b) 50ns
(c) 75ns (d) 100ns

30. The figure of merit of a logic family is given by

- (a) Gain bandwidth product
- (b) (Propagation delay time) * (power dissipation)
- (c) (Fan out) * (propagation delay time)
- (d) (Noise margin) * (power dissipation)

31. Figure below shown as ripple counter using positive edge triggered flip flops. If the present state of the counters is $Q_2 Q_1 Q_0 = 011$, then its next state ($Q_2 Q_1 Q_0$) will be



- (a) 010
- (b) 100
- (c) 111
- (d) 101

32. Generally _____ flip flops are used in shift registers.

- (a) D
- (b) JK
- (c) SR
- (d) T

33. The universal shift register can carry out

- (a) Any one of serial and parallel data transfer
- (b) Parallel data transfer
- (c) Both serial and parallel data transfer
- (d) Serial data transfer

34. To operate correctly, starting a ring counter requires

- (a) Clearing one flip-flop and presenting all the others.
- (b) Clearing all the flip-flops
- (c) Presenting one flip-flop and clearing all others.
- (d) Presenting all the flip-flops.

35. Race around condition always arises in a _____ circuit.

- (a) Digital
- (b) Synchronous
- (c) Asynchronous
- (d) Combinational

36. EPROM is

- (a) Ultraviolet-light erasable and electrically programmable
- (b) Infrared-light erasable and magnetically programmable
- (c) Electrostatically erasable and magnetically programmable
- (d) Magnetically erasable and electrically programmable

37. Consider the following 8085 assembly program:

```
MVI    B, 89H
MOV    A, B
MOV    C, A
MVI    D, 37H
OUT    PORT1
HLT
```

The output at PORT1 is

- (a) 89H
- (b) 37H
- (c) 00
- (d) none of these

38. Op-amp is _____ amplifier.
- (a) Resistive coupled low gain (b) RC coupled high gain
(c) Direct coupled low gain (d) None of these
39. For a difference amplifier CMRR should be
- (a) As small as possible (b) As large as possible
(c) Unity (d) Zero
40. Schmitt trigger is also known as
- (a) Squaring circuit (b) Sweep circuit
(c) Blocking oscillator (d) Sinusoidal circuit
41. Which of the following circuit is used as a voltage to frequency converter?
- (a) Schmitt trigger (b) Astable multivibrator
(c) Bistable multivibrator (d) Monostable multivibrator
42. Which of the following properties of op-amp permits voltage gain down to zero frequency?
- (a) Feedback (b) Direct coupling
(c) Capacitance coupling (d) High open loop gain
43. The frequency of a monostable multivibrator is _____ the frequency of triggering pulse.
- (a) Equal to (b) One-half
(c) Twice (d) Thrice
44. The frequency of oscillation of an Astable multivibrator depends mainly on
- (a) Value of collector load resistors (b) RC value of the circuit
(c) Value of transistor (d) Width of the input pulse
45. In a circuit, if the open loop gain is 106 and output voltage is 10V, the differential voltage should be
- (a) $10\mu\text{V}$ (b) 0.1V
(c) $100\mu\text{V}$ (d) $1\mu\text{V}$
46. An ideal saw tooth voltage waveform of frequency 500Hz and amplitude 3V is generated by charging a capacitor of $2\mu\text{F}$ in every cycle. The charging requires
- (a) Constant voltage source of 3V for 1ms (b) Constant voltage source of 3V for 2ms
(c) Constant current source of 3mA for 1ms (d) Constant current source of 3mA for 2ms
47. The number of output steps in a D/A converter is
- (a) 2^{n+1} (b) 2^n
(c) 2^{2n} (d) 2^{n-1}
48. A triangular-square wave generator uses
- (a) A sine wave oscillation & a comparator (b) An integrator & a comparator
(c) A differentiator & a comparator (d) A sine wave oscillator & a clipper
49. An analog voltage is in the range of 0V to 8V is divided in eight equal intervals for conversion to 3-bit digital output. The maximum quantization error is
- (a) 0V (b) 0.5V
(c) 1V (d) 2V

50. The dual slope integration type A/D converter provides
- (a) Higher speeds compared to all other type of A/D converter
 - (b) Very good accuracy with out putting extreme requirements on component stability
 - (c) Poor rejection of power supply hum
 - (d) Better resolution compared to all other types of A/D converters for the same number of bits
51. In an op-amp by using binary weight resistors the summing circuit
- (a) Can build a D/A converter
 - (b) Can build a A/D converter
 - (c) Can be used as a differentiator
 - (d) Can be used as a integrator
52. Ideal op-amp has
- (a) Wide phase shift at all frequencies and narrow bandwidth
 - (b) Zero phase shifts at all frequencies and infinite bandwidth
 - (c) Zero phase shifts at all frequencies and narrow bandwidth
 - (d) Phase shift and bandwidth proportional to frequencies
53. In a op-amp at higher frequencies
- (a) Output voltage leads w.r.t. input voltage
 - (b) Output voltage lags w.r.t. input voltage
 - (c) Output voltage tends to be in phase with the input voltage
 - (d) Output voltage tends to be 180° out of phase with the input voltage
54. The input & output impedance of IC-741 could be
- (a) 75Ω & 100Ω
 - (b) 100Ω & $1K\Omega$
 - (c) $1K\Omega$ & $1M\Omega$
 - (d) $1M\Omega$ & 175Ω
55. The first stage of an op-amp is always
- (a) Class B amplifier
 - (b) Class B push pull amplifier
 - (c) A differential amplifier
 - (d) A Darlington amplifier
56. The internal RAM memory of 8051 is
- (a) 32 bytes
 - (b) 64 bytes
 - (c) 128 bytes
 - (d) 256 bytes
57. The SP is of ___ wide register and this may be defined anywhere in the _____.
- (a) 8 byte, on-chip 128 byte RAM.
 - (b) 8 bit, on chip 256 byte RAM.
 - (c) 16 bit, on-chip 128 byte ROM
 - (d) 8 bit, on chip 128 byte RAM.
58. Serial port interrupt is generated, if ___ bits are set
- (a) IE
 - (b) RI, IE
 - (c) IP, TI
 - (d) RI, TI
59. In 8051 which interrupt has highest priority?
- (a) IE1
 - (b) TF0
 - (c) IE0
 - (d) TF1

60. MOVA, @R1 will
- (a) Copy R1 to the accumulator
 - (b) Copy the accumulator to R1
 - (c) Copy the contents of memory whose address is in R1 to the accumulator
 - (d) Copy the accumulator to the contents of memory whose address is in R1
61. Bit-addressable memory locations are
- (a) 10H through 1FH
 - (b) 30H through 3FH
 - (c) 40H through 4FH
 - (d) 20H through 2FH
62. The contents of the accumulator after this operation
- ```
MOV A,#0BH
ANL A,#2CH
```
- will be
- (a) 00001000
  - (b) 11010111
  - (c) 11011010
  - (d) 00101000
63. When 8051 wakes up then 0x00 is loaded to which register?
- (a) DPTR
  - (b) SP
  - (c) PC
  - (d) PSW
64. What is the address range of SFR Register bank?
- (a) 00H-77H
  - (b) 40H-80H
  - (c) 80H-7FH
  - (d) 80H-FFH
65. An alternate function of port pin P3.0 (RXD) in the 8051 is:
- (a) Serial port input
  - (b) Serial port output
  - (c) Memory write strobe
  - (d) Memory read strobe
66. The ripple factor of a power supply is a measure of
- (a) Its filter efficiency
  - (b) Its voltage regulation
  - (c) Diode rating
  - (d) Purity of power output
67. If the load current drawn by unregulated power supply increases, the d.c. output voltage.
- (a) Increases
  - (b) Decreases
  - (c) Stays the same
  - (d) None of these
68. A signal contains components with frequencies up to 10 kHz, although no useful information is contained at frequencies above 6 kHz. What is the minimum frequency at which the signal should be sampled?
- (a) 6 kHz
  - (b) 12 kHz
  - (c) 14.4 kHz
  - (d) 20 kHz
69. What is the resolution of a 12-bit data converter?
- (a) 0.00024%
  - (b) 0.0041%
  - (c) 0.024%
  - (d) 0.41%
70. What is meant by a single-chip data acquisition system?
- (a) A single integrated circuit containing an ADC and a multiplexer
  - (b) A single integrated circuit containing a DAC and a demultiplexer
  - (c) A single integrated circuit containing all the elements of a data acquisition system
  - (d) A single integrated circuit containing an ADC and a DAC

71. A function generator can produce
- (a) Many identical waves
  - (b) Square and sine waves only
  - (c) Different types of waves simultaneously
  - (d) None of the mentioned
72. The value of current and frequency of the output waveform are 5A and 13.33kHz. Find the capacitance value in function generator?
- (a) 250 $\mu$ F
  - (b) 120 $\mu$ F
  - (c) 850 $\mu$ F
  - (d) 370 $\mu$ F
73. Which device is used for diagnostic purposes and for recording?
- (a) Low pass filter
  - (b) Monolithic PLL
  - (c) Voltage Controlled Oscillator
  - (d) None of the mentioned
74. Determine the value of current flow in VCO, when the NE566 VCO external timing resistor  $R_T = 250\Omega$  and the modulating input voltage  $V_C = 3.25V$ . (Assume  $V_{cc} = +5v$ ).
- (a) 3mA
  - (b) 12mA
  - (c) 7mA
  - (d) 10mA
75. The transconductance  $g_m$  is defined as  $g_m = \partial i_o / \partial V_{in}$  its value in terms of h-parameters is
- (a)  $h_{ie}/h_{fe}$
  - (b)  $h_{fe}/25$
  - (c)  $h_{fe}/h_{ie}$
  - (d) none of these

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