

MIZORAM PUBLIC SERVICE COMMISSION
TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO
JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE
UNDER POWER & ELECTRICITY DEPARTMENT, NOVEMBER, 2015

ELECTRICAL ENGINEERING
PAPER - III

Time Allowed : 3 hours

Full Marks : 200

Attempt all questions.

Part A - Objective Type Questions (100 Marks)

All questions carry equal marks of 2 each.

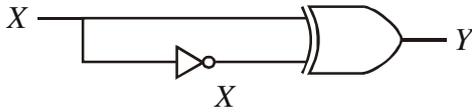
*This Part should be answered only on the **OMR Response Sheet** provided.*

1. In an *npn* transistor, the majority carriers in the emitter are
 - (a) free electrons
 - (b) holes
 - (c) neither
 - (d) both
2. Transistor is a
 - (a) current controlled current device
 - (b) current controlled voltage device
 - (c) voltage controlled voltage device
 - (d) voltage controlled current device
3. Zener diodes are commonly used as
 - (a) rectifiers
 - (b) voltage regulators
 - (c) amplifiers
 - (d) none of these
4. Which of the following transistor configurations has the highest power gain?
 - (a) common base
 - (b) common emitter
 - (c) common collector
 - (d) none of these
5. The number of diodes required in a bridge rectifier circuit is
 - (a) one
 - (b) two
 - (c) three
 - (d) four
6. Out of the following devices, the fastest switching device is
 - (a) JFET
 - (b) BJT
 - (c) MOSFET
 - (d) triode
7. Thyristor is nothing but a
 - (a) controlled switch
 - (b) controlled transistor
 - (c) amplifier with large current rating
 - (d) amplifier with higher gain
8. The output of a 2-input OR gate is zero only when
 - (a) both inputs are 0
 - (b) either input is 0
 - (c) both inputs are 1
 - (d) either input is 1

9. Which logic gates are designated as universal gates?
- (a) NOT, OR and AND gates (b) XNOR, NOR and NAND gates
(c) NOR and NAND gates (d) XOR, NOR and NAND gates
10. The basic elements of a microprocessor are
- (a) ALU and memory (b) ALU and control unit
(c) ALU, memory and I/O devices (d) ALU, control unit and memory
11. In microprocessor architecture, flag indicates
- (a) the number of the microprocessor (b) the name of the manufacturer
(c) the internal status of the CPU (d) the bit size of the microprocessor
12. A modulator is a system to
- (a) separate two frequencies
(b) impress the information on to a radio frequency carrier
(c) extract information from the carrier
(d) amplify the audio frequency signal
13. The main purpose of modulation is to
- (a) combine two waves of different frequencies
(b) achieve wave-shaping of the carrier wave
(c) transmit low-frequency information over long distances efficiently
(d) produce sidebands
14. The most useful modulation technique for high fidelity audio broadcasting on radio in current practice is
- (a) amplitude modulation (b) frequency modulation
(c) pulse amplitude modulation (d) pulse code modulation
15. Which of the following has the longest wavelength?
- (a) HF (b) VHF
(c) UHF (d) SHF
16. A power chopper converts
- (a) a.c. to d.c. (b) d.c. to d.c.
(c) d.c. to a.c. (d) a.c. to a.c.
17. A thyristor controlled reactor is used to get
- (a) variable resistance (b) variable capacitance
(c) variable inductance (d) improved reactive power factor
18. The majority carriers in the emitter of a PNP transistor
- (a) holes (b) electrons
(c) atom (d) molecule
19. A Z-diode is normally operated in
- (a) Forward bias mode (b) Reverse bias mode
(c) Rectifier mode (d) Converter mode

20. A common emitter BJT amplifier does
- (a) Voltage amplification
 - (b) Both Voltage and Current amplification
 - (c) Current amplification
 - (d) Non of these

21. The output Y of the logic circuit given in the following figure is



- (a) 1
 - (b) X
 - (c) 0
 - (d) \bar{X}
22. In 8085 name the 16 bit registers
- (a) Stack pointer
 - (b) Register B
 - (c) Register A
 - (d) PSW
23. Instruction RET (Return) of a 8085 microprocessor
- (a) Stack Pointer and Program counter
 - (b) Stack Pointer only
 - (c) Program counter only
 - (d) Set Interrupt Mask and Acc
24. Instruction CALL of a 8085 microprocessor has
- (a) 1 byte
 - (b) 2 bytes
 - (c) 4 bytes
 - (d) 3 bytes
25. The TIMER of PPI 8155 is of
- (a) 16 bits
 - (b) 14 bits
 - (c) 12 bits
 - (d) 8 bits
26. Which of the following modulation techniques has got maximum SNR?
- (a) AM-SSB
 - (b) AM-DSB
 - (c) FM
 - (d) AM-SC
27. A broadcast AM radio transmitter radiates 125 kW when the modulation percentage is 70. How much of this is carrier power?
- (a) ≈ 25 kW
 - (b) 50 kW
 - (c) 75 kW
 - (d) 100 kW
28. One disadvantage of adaptive delta modulation over linear delta modulation is that it
- (a) requires more bandwidth
 - (b) is more vulnerable to channel errors
 - (c) requires a large number of comparators in the encoder
 - (d) is not suitable for signals with periodic components
29. An FM wave uses a 2-5 V, 500 Hz modulating frequency and has a modulation index of 50. The deviation is
- (a) 500 Hz
 - (b) 100 Hz
 - (c) 1250 Hz
 - (d) 25000 Hz
30. The anode current through a conducting SCR is 10A. If its gate current is made one-fourth, then what will be the anode current?
- (a) 0
 - (b) 5A
 - (c) 10A
 - (d) 20A

31. AC voltage regulators are widely used in
- (a) traction drives
 - (b) fan drives
 - (c) synchronous motor drives
 - (d) slip power recovery scheme of slip-ring induction motor
32. A modern power semiconductor device that combines the characteristics of BJT and MOSFET is
- (a) GTO
 - (b) FCT
 - (c) IGBT
 - (d) MCT
33. TRIACS can't be used in AC voltage regulator for a
- (a) resistive load
 - (b) back emf load
 - (c) inductive load
 - (d) resistive inductive load
34. In a self controlled synchronous motor fed from a variable frequency inverter,
- (a) the rotor poles invariably have damper windings
 - (b) there are stability problems
 - (c) the speed of the rotor decides stator frequency
 - (d) the frequency of the stator decides the rotor speed
35. The depletion region in an open circuited P-N junction diode contains
- (a) Electrons
 - (b) Holes
 - (c) Uncovered immobile impurity ions
 - (d) Neutralised impurity atoms
36. The width of the depletion layer of a junction
- (a) Decreases with light doping
 - (b) Increases with heavy doping
 - (c) Is independent of applied voltage
 - (d) Is increased under reversed bias
37. A tunnel diode is
- (a) A very heavily doped PN junction diode
 - (b) A high resistivity PN junction diode
 - (c) A slow switching device
 - (d) Used with reverse bias
38. A zener diode
- (a) Has a high forward voltage rating
 - (b) Has a sharp breakdown at low reverse voltage
 - (c) Is useful as an amplifier
 - (d) Has a negative resistance
39. Which of the following specifications is not correct for a common collector amplifier?
- (a) High input impedance
 - (b) Low output impedance
 - (c) High voltage gain
 - (d) High current gain
40. The POS form of expression is suitable for circuit using
- (a) XOR
 - (b) NAND
 - (c) AND
 - (d) NOR
41. An EX-OR gate produces an output only when its two inputs are
- (a) Same
 - (b) Different
 - (c) High
 - (d) low

42. A microprocessor contains ROM chip which contain
- (a) Control function
 - (b) Arithmetic function
 - (c) Instruction to execute data
 - (d) Memory functions
43. The program counter in a 8085 microprocessor is a 16-bit register, because
- (a) It counts 16 bits at a time
 - (b) There are 16 address lines
 - (c) It facilities the user storing 16 bit data temporarily
 - (d) It has to fetch two 8-bit data at a time
44. Output of the assembler in machine code is referred to as
- (a) Object program
 - (b) Source program
 - (c) Macroinstruction
 - (d) Symbolic instruction
45. Both the ALU and control section of CPU employ which special purpose storage locations?
- (a) Buffers
 - (b) Decoders
 - (c) Accumulators
 - (d) Registers
46. After completing the execution, microprocessor returns to
- (a) Halt state
 - (b) Execute state
 - (c) Fetch state
 - (d) Interrupt state
47. Eight memory chips of 32×4 bit size have their address buses connected together. What is the size of this memory system?
- (a) 512×2 bits
 - (b) 256×4 bits
 - (c) 64×16 bits
 - (d) 32×32 bits
48. In AM, the carrier is changed by a modulating signal. What parameter of the carrier is changed?
- (a) amplitude
 - (b) frequency
 - (c) pulse width
 - (d) phase
49. After firing an SCR, the gate pulse is removed. The current in the SCR will
- (a) remain the same
 - (b) immediately fall to zero
 - (c) rise up
 - (d) rise a little and then fall to zero
50. Thyristors connected in series need
- (a) static equalizing circuit
 - (b) dynamic equalizing circuit
 - (c) both static and dynamic equalizing circuits
 - (d) none of these

Part B - Short Answer Questions (100 Marks)

All questions carry equal marks of 5 each.

This Part should be answered only on the Answer Booklet provided.

1. What are n-type and p-type semiconductors? Explain with the help of energy diagrams.
2. Draw circuits and derive expressions to demonstrate the use of an op-amp as
 - (a) an integrator
 - (b) a differentiator
3. What is feedback in amplifiers? What are the advantages of negative feedback in amplifiers? Explain them.

4. What do you mean by multiplexing? What is the difference between Frequency Division multiplexing and Time Division multiplexing?
5. Draw electrical equivalent circuit of a power MOSFET, and explain why they are preferred in the inverter application.
6. Discuss briefly the working principle of switched mode power supplies (SMPS).
7. Draw and explain the diode characteristic both in forward and reverse bias mode.
8. Determine the turn ratio of transformer for a half wave rectifier, if desired DC voltage of the rectifier (without filter) is 10 V. Take the input AC voltage of the transformer as 220 V.
9. Draw and explain the output characteristics of a common emitter npn transistor configuration. Also, use the characteristics to explain its amplification property.
10. Explain the detection of AM wave using square law detector. Compare Square law detector with envelope detector.
11. Explain 'Zener breakdown' and 'Avalanche breakdown' in a semiconductor.
12. Describe the different current components in a P-N diode.
13. What do you understand by closed loop and open loop gain of an OP-AMP? When does a non-inverting OP-AMP act as a voltage follower?
14. Explain why a latch is used for an output port but a tri-state buffer can be used for an input port.
15. Draw the 8085 pin diagram and label the pins.
16. With the help of simple mathematical expressions, explain the basic difference between frequency and phase modulation.
17. Why is DSB-FC transmission system widely used in broadcasting in spite of the fact that SSB-SC of SSB transmission system has numerous advantages over it?
18. Draw the circuit configuration of a 3-phase half controlled bridge rectifier with resistive load. Also draw the output voltage waveform for $\alpha=\pi/3$.
19. What is the effect of source reactance on the output voltage of a controlled rectifier circuit?
20. Give the layout of a thyristor control reactor scheme and explain its operation.

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