

MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR
PRINCIPAL, GOVT. INDUSTRIAL TRAINING INSTITUTE
UNDER LABOUR, EMPLOYMENT, SKILL DEVELOPMENT & ENTREPRENEURSHIP
DEPARTMENT, GOVERNMENT OF MIZORAM, JANUARY-2024

ELECTRICAL ENGINEERING PAPER-III

Time Allowed : 3 hours

FM : 200

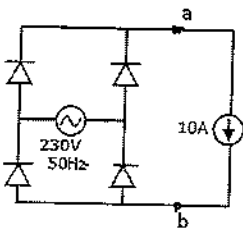
SECTION - A (Multiple Choice questions) (100 Marks)

All questions carry equal mark of 2 each. Attempt all questions.

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

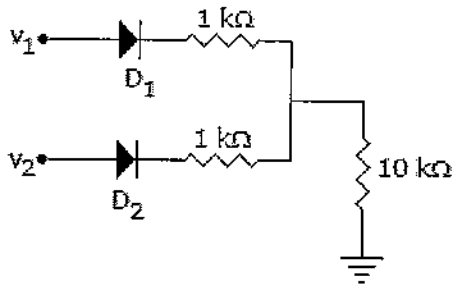
1. Assume that the counter is holding the count 0101. What will be the count after 27 clock pulses?
(a) 0101 (b) 0001
(c) 1111 (d) 0000
2. The problem of 'Current hogging' is associated with
(a) DCTL gates (b) DTL gates
(c) ECL gates (d) CMOS gates
3. A two stage amplifier with negative feedback has an overshoot when a damping factor 'k' is
(a) less than unity (b) greater than unity
(c) zero (d) negative
4. A p-n junction diode's dynamic conductance is directly proportional to
(a) the applied voltage (b) the temperature
(c) its current (d) the internal voltage
5. What is the direction of data bus?
(a) Unidirectional into μP
(b) Unidirectional out of μP
(c) Bidirectional
(d) Mixed direction i.e. some lines into μP and some others out of μP
6. The stack pointer in the 8085 microprocessor is a
(a) 16 bit register that point to stack memory locations
(b) 16 bit accumulator
(c) Memory location in the stack
(d) Flag register used for the stack
7. When the modulating frequency is doubled, the modulation index is halved, and the modulating voltage remains constant. The modulation system
(a) amplitude modulation (b) phase modulation
(c) frequency modulation (d) none of these

8. In a communications system, noise is most likely to affect the signal
(a) at the transmitter (b) in the channel
(c) in the information source (d) at the destination
9. The transmission bandwidth is doubled in FM. The SNR is
(a) also doubled (b) improved four fold
(c) decreased by one fourth (d) unaffected
10. In a thyristor, ratio of latching current to holding current is
(a) 0.4 (b) 1.0
(c) 2.5 (d) 6.0
11. A four quadrant chopper cannot be operated as
(a) One quadrant chopper (b) Cyclo-converter
(c) Inverter (d) Bi-directional rectifier
12. In a three-phase full wave AC to DC converter, the ratio of output ripple frequency to the supply voltage frequency is
(a) 2 (b) 3
(c) 6 (d) 12
13. During the turn off process of a thyristor the current flow does not stop at the instant when the current reaches zero but continues to flow to a peak value in the reverse direction. This is due to
(a) Commutation failure
(b) Hole storage effect
(c) Presence of reverse voltage across the thyristor
(d) Protective inductance in series with the thyristor
14. A step-up chopper has source voltage 50 V and output voltage 100 V. If pulse width is 10 μ s, the chopping frequency will be
(a) 50 KHz (b) 100 KHz
(c) 5 KHz (d) 10 KHz
15. Audio signal cannot be transmitted because
(a) The signal has more noise
(b) The signal cannot be amplified for distance communication
(c) The transmitting antenna length is very small to design
(d) The transmitting antenna length is very large and impracticable
16. If current source is replaced by resistance R then find the value of R, to maintain same current through branch ab



- (a) 22 Ω (b) 23 Ω
(c) 24 Ω (d) 21 Ω

17. The logical sum of two or more than two logical products is termed as
(a) OR operation (b) POS
(c) SOP (d) NAND operation
18. The total power content of an AM wave is 1500W. For 100% modulation, the power transmitted by the carrier is
(a) 500 W (b) 700 W
(c) 750 W (d) 1000 W
19. In the figure below $v_1 = 8\text{ V}$ and $v_2 = 4\text{ V}$. Which diode will conduct?



- (a) D_1 only (b) D_2 only
(c) Both D_1 and D_2 (d) Neither D_1 nor D_2
20. The Octal equivalent of the binary number 1011101011 is
(a) 7353 (b) 5657
(c) 5651 (d) 1353
21. Which condition is shown in J-K flip flop as no changes next state from next state?
(a) $J=0, K=1$ (b) $J=0, K=0$
(c) $J=1, K=1$ (d) $J=1, K=0$
22. The major advantage of FM over AM is
(a) Reception is less noisy (b) Higher carrier frequency
(c) Smaller bandwidth (d) Small frequency deviation
23. The IF is 455 kHz. If the radio receiver is tuned to 855 kHz, the local oscillator frequency is
(a) 455 kHz (b) 1500 kHz
(c) 1310 kHz (d) None of these
24. In a pn junction diode under reverse bias, the magnitude of electric field is maximum at
(a) the edge of the depletion region on the p side
(b) the edge of the depletion region on the n side
(c) the pn junction
(d) the center of the depletion region on the n side
25. What is the binary subtraction of $101001 - 010110 = ?$
(a) 010011 (b) 100110
(c) 011001 (d) 010010
26. The workers are hell bent at getting what is due to them
(a) hell bent for getting (b) hell bent on getting
(c) hell bent upon getting (d) No improvement

Directions (Question Nos. 27 & 28) : Choose the one which can be substituted for the given word/sentence.

- 27. Extremely old age when man behaves like a fool
 - (a) Imbecility
 - (b) Senility
 - (c) Dotage
 - (d) Superannuation
- 28. The study of ancient societies
 - (a) Anthropology
 - (b) Archaeology
 - (c) History
 - (d) Ethnology

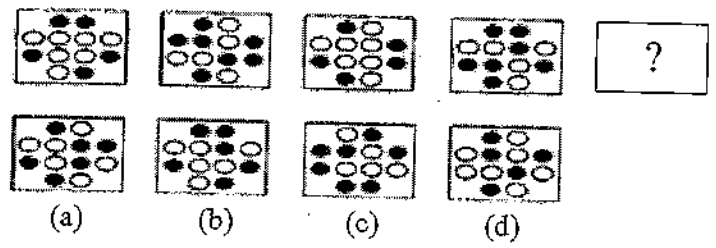
Directions (Question Nos. 29 & 30) : Choose the word which best expresses the meaning of the given word.

- 29. CORPULENT
 - (a) Lean
 - (b) Gaunt
 - (c) Emaciated
 - (d) Obese
- 30. EMBEZZLE
 - (a) Misappropriate
 - (b) Balance
 - (c) Remunerate
 - (d) Clear

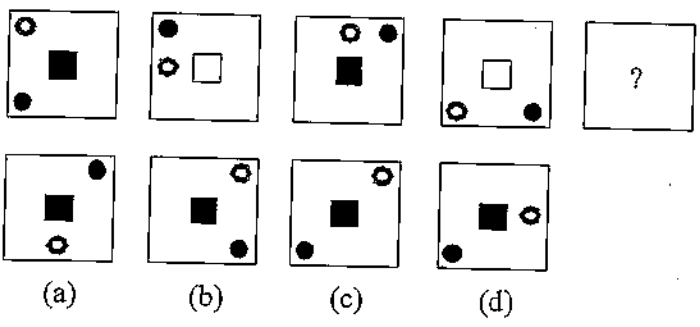
Directions (Question Nos. 31 & 32) : Choose the correct meaning of proverb/idiom

- 31. To make clean breast of
 - (a) To gain prominence
 - (b) To praise oneself
 - (c) To confess without of reserve
 - (d) To destroy before it blooms
- 32. Rub shoulders with
 - (a) come in contact with
 - (b) quarrel with a person
 - (c) rub shoulder of someone
 - (d) accept a challenge

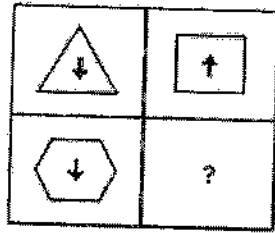
33. Which shape comes next in the sequence



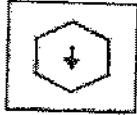
34. Complete the sequence



35. Which of the following best matches the relationship between the shapes in the image?



(a)



(b)



(c)

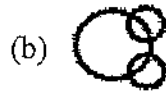


(d)

36. Which of the following diagrams indicates the best relation between Factory, Product and Machinery?



(a)



(b)

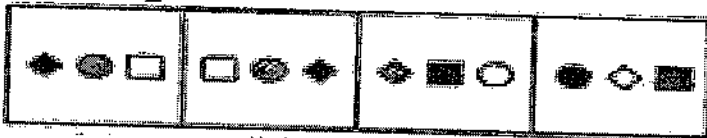
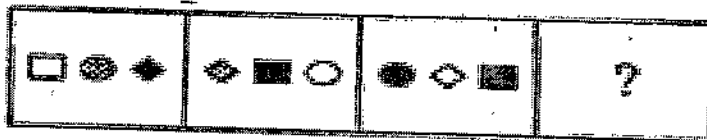


(c)



(d)

37. Identify the change in shape and fill up the blank:



(a)

(b)

(c)

(d)

38. Excluding stoppages, the speed of a bus is 54 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour?

(a) 9

(b) 10

(c) 12

(d) 20

39. Which of the given shapes is a rotation of the main image?



(a)



(b)

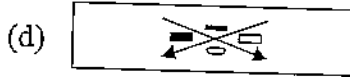
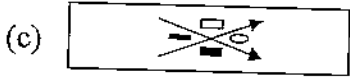
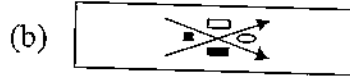
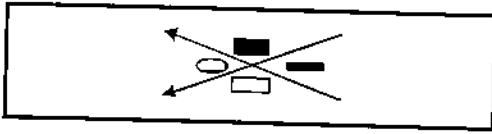


(c)

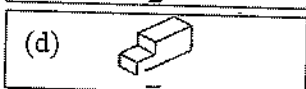
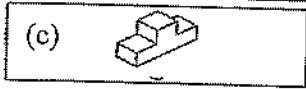
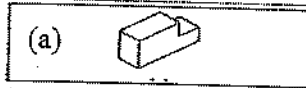
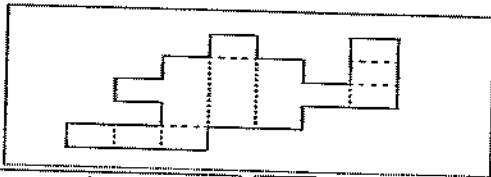


(d)

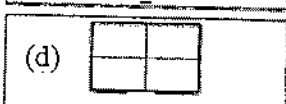
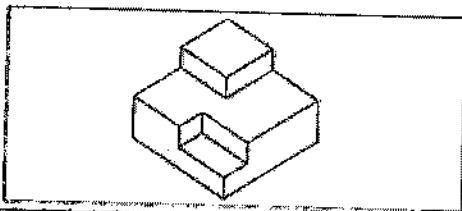
40. Which of the 4 figures presented (A, B, C, D) is a rotation of the first?



41. Which object can be made by folding the given shape?



42. Which of these images is the top view of the given object?



43. Find the odd word

Bhagwad Geeta; Quran; Ramayana; Mahabharata

(a) Quran

(b) Bhagwad Geeta

(c) Ramayana

(d) Mahabharata

44. Find the odd pair out

(a) AZ

(b) BY

(c) CX

(d) DV

45. A hater of knowledge and learning

(a) Misologist

(b) Bibliophile

(c) Philologist

(d) Mysogynist

46. A person who renounces the world and practices self-discipline in order to attain salvation
- (a) Devotee
 - (b) Sceptic
 - (c) Ascetic
 - (d) Antiquarian

Directions to solve Question Nos. 47-48 : In each of the following questions, there is some relationship between the two terms to the left of (: :) and the same relationship holds between the two terms to its right. Also, in each question, one term either to the right of (: :) or to the left of it is missing. This term is given as one of the alternatives given below each question. Find out this term.

47. NO : RS :: TU : ?

- (a) XY
- (b) YX
- (c) ZY
- (d) YZ

48. HCM : FAK :: SGD : ?

- (a) QEB
- (b) QIB
- (c) ESQ
- (d) GES

Direction to solve Question Nos. 49 - 50 : In each of the following questions, one number is wrong in the series. Find out the wrong number

49. 1, 2, 5, 14, 41, 124

- (a) 2
- (b) 5
- (c) 14
- (d) 124

50. 6, 12, 21, 32, 45, 60

- (a) 6
- (b) 12
- (c) 21
- (d) 35

SECTION - B (100 Marks)

All questions carry equal marks of 10 each.

This Section should be answered only on the Answer Sheet provided.

1. (a) What is the difference between synchronous and asynchronous counter. (2)
(b) Implement J-K flip flop using D flip flop. (8)
2. (a) Explain the R-C coupled amplifier. (5)
(b) Draw the circuit of a BJT in potential divider bias configuration. Derive the expression for Q point voltage and current. (5)
3. (a) Define and explain the addressing mode used in 8085 microprocessor with the help of example. (5)
(b) How many interrupts are there in 8051 microcontroller? Explain each interrupt in brief. (5)
4. (a) What is amplitude modulation? Draw an AM wave. Give its important features. (2+1+2=5)
(b) Derive an expression for amplitude modulated wave. (5)
5. (a) Describe the different modes of operation of a thyristor with the help of its V-I Characteristics. (6)
(b) What is an Ac voltage controller? Explain the working principle of single phase half wave AC voltage controller. (1+3=4)
6. Explain the operation of single-phase, half controlled bridge converter with resistive load and inductive load with the associated waveforms. Derive the expression for average load voltage, average load current and RMS load voltage. (5+5=10)
7. Draw the following waveforms for 3-phase controlled rectifier using R-L load with sufficiently high value of inductance for firing angle $\alpha = 60^\circ$ and 120° (i) Output voltage (ii) Voltage across SCR1 and also derive the expression for average output voltage. (10)
8. (a) Explain voltage regulator using Zener diode. (5)
(b) When negative voltage feedback is applied to an amplifier of gain 100, the overall gain falls to 50. (i) Calculate the fraction of the output voltage feedback. (ii) If this fraction is maintained, calculate the value of the amplifier gain required if the overall stage gain is to be 75. (5)
9. Draw and discuss the internal architecture of 8085 microprocessor. (10)
10. Draw a square law demodulator circuit used for demodulation of AM and explain its operation. (10)

* * * * *