SET 2013

PAPER – II

ELECTRONIC SCIENCE

Signature of the Invigilator | Question Booklet No. .....

1. | OMR Sheet No.. .....

Subject Code 14 | **ROLL No.**

Time Allowed : 75 Minutes | **Max. Marks : 100**

No. of pages in this Booklet : **11** | No. of Questions : **50**

INSTRUCTIONS FOR CANDIDATES

1. Write your Roll No. and the OMR Sheet No. in the spaces provided on top of this page.
2. Fill in the necessary information in the spaces provided on the OMR response sheet.
3. This booklet consists of fifty (50) compulsory questions each carrying 2 marks.
4. Examine the question booklet carefully and tally the number of pages/questions in the booklet with the information printed above. **Do not accept a damaged or open booklet**. Damaged or faulty booklet may be got replaced within the first **5** minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time given.
5. Each Question has four alternative responses marked (A), (B), (C) and (D) in the OMR sheet. You have to completely darken the circle indicating the most appropriate response against each item as in the illustration.

6. All entries in the common OMR response sheet for Papers I and II are to be recorded in the original copy only.
7. Use only Blue/Black Ball point pen.
8. Rough Work is to be done on the blank pages provided at the end of this booklet.
9. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except in the spaces allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
10. You have to return the Original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. **You are, however, allowed to carry the test booklet and the duplicate copy of OMR Sheet** on conclusion of examination.
11. Use of any calculator, mobile phone or log table etc. is strictly prohibited.
12. **There is no negative marking.**

14-13

ELECTRONIC SCIENCE
PAPER—II

Note :— This paper contains **fifty (50)** objective type questions, each question carrying **two (2)** marks. Attempt **all** the questions.

1. Boron and Aluminium are two commonly used trivalent impurities used for doping of a semiconductor. Another is :
   (A) Arsenic
   (B) Phosphorous
   (C) Indium
   (D) None of these

2. The units of (q/kT) are :
   (A) V
   (B) V^{-1}
   (C) J
   (D) J/K

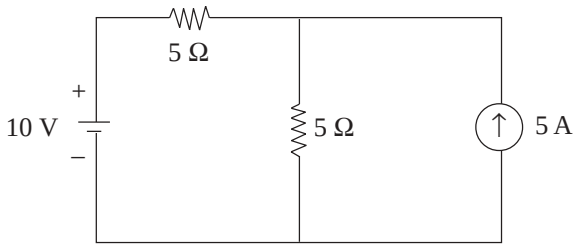
3. Which of the following diodes has a relatively high dopant concentration ?
   (A) Varactor
   (B) Tunnel Diode
   (C) PIN Diode
   (D) Schottky Barrier Diode

4. The static characteristics of an adequately biased p-n junction diode is a straight line, if the plot is of :
   (A) I vs. V
   (B) I vs. log(V)
   (C) Log(I) vs. V
   (D) Log(I) vs. log(V)

5. Typical values of sheet resistance of Polysilicon lie between :
   (A) 1 – 5 Ω/sq
   (B) 10 – 50 Ω/sq
   (C) 1 – 5 kΩ/sq
   (D) 10 – 50 kΩ/sq

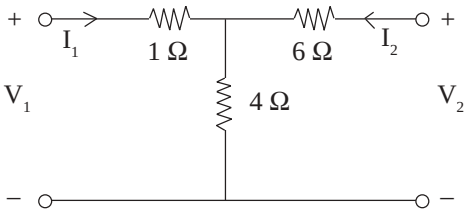
6. Pure inductive circuit takes power from the *ac* line when :
   (A) Both applied voltage and current rise.
   (B) Both applied voltage and current decreases.
   (C) Applied voltage decreases but current increases.
   (D) None of the above is necessary.

7. The voltage across 5 A source in the given circuit is :



   (A) 25 volts
   (B) 15 volts
   (C) 17.5 volts
   (D) 20 volts

8. For the network shown, the parameters h_{11} and h_{21} are :



   (A) 5 Ω and –2/3
   (B) 3.4 Ω and –2/5
   (C) 3.4 Ω and –3/5
   (D) None of the above

9. A connected planar network has 4 nodes and 5 elements. The number of meshes in its dual network is :

(A) 4

(B) 3

(C) 2

(D) 1

10. The transient current in a network is

$i(t) = 2e^{-t} - e^{-5t}$, $t \geq 0$.

The pole-zero configuration of I(s) is :

	Poles	**Zeroes**
(A)	1, 5	9
(B)	–1, –5	–9
(C)	2, –1	–1, –5
(D)	2, –1	1, 5

11. The nature of feedback in an inverting voltage amplifier is :

(A) Current-shunt

(B) Current-series

(C) Voltage-series

(D) Voltage-shunt

12. The large signal bandwidth of an operational amplifier is limited by its :

(A) Slew rate

(B) CMRR

(C) Gain-bandwidth product

(D) None of these

13. If the inverting input terminal of an opamp is grounded and a sinusoidal voltage waveform is applied at the non-inverting input terminal, the output will be a :

(A) Half-wave rectified sine wave

(B) Full-wave rectified sine wave

(C) Triangular wave

(D) Square wave

14. An amplifier has an input power of 2 µW. The power gain of the amplifier is 10 dB. The output power will be :

(A) 5 µW

(B) 20 µW

(C) 200 µW

(D) 2 W

15. The maximum theoretical efficiency of a Class-B push-pull transistor amplifier is approximately :

(A) 25%

(B) 50%

(C) 71%

(D) 78%

16. In Boolean algebra, $x + yz$ =

(A) $(x + y)z$

(B) $x + y + z$

(C) $(x + y)(x + z)$

(D) $xy + xz$

17. It is required to make a controlled inverter using a 2-input logic gate. One of the inputs will act as external input X, while the other will be set to 0 to get X' at the output and set to 1 to get X at the output. The required gate is :

(A) XOR

(B) XNOR

(C) NAND

(D) NOR

18. The total number of rows in the truth table of a logic function of M variables is :

(A) M

(B) $\log_2 M$

(C) 2^M

(D) 2^{M+1}

19. A ROM is a :
(A) Combinational circuit
(B) Sequential circuit
(C) Storage register
(D) RAM with Write operation disabled

20. A T(Toggle) flip flop can be constructed using JK flip flop by making :
(A) J = T, K = T'
(B) J = T', K = T
(C) J = T', K = T'
(D) J = T, K = T

21. Which is the longest instruction of 8085 microprocessor ?
(A) CALL address
(B) JMP address
(C) RST 5
(D) STA address

22. What is the benefit of multiplexing an address/data bus in 8085 microprocessor ?
(A) Speed improvement
(B) Pin count reduction
(C) Reduction in additional hardware requirement
(D) None of the above

23. If the clock frequency of 8085 microprocessor is 3 MHz, specify the time required to execute MVI A, 08H instruction :
(A) 10/3 µs
(B) 4/3 µs
(C) 7/3 µs
(D) 13/3 µs

24. Name the instruction of 8085 microprocessor that belongs to register indirect addressing mode :
(A) STAX D
(B) MVI A, 09 H
(C) STA address
(D) MOV A, B

25. Which peripheral is needed for designing a digital clock in an 8085 microprocessor ?
(A) 8259
(B) 8254
(C) 8251
(D) 8257

26. Which of the following statements can be used to round off a value from 1.66 to 2.0 ?
(A) ceil(1.66)
(B) floor(1.66)
(C) roundup(1.66)
(D) roundto(1.66)

27. C is a _____ language.
(A) High level
(B) Low level
(C) Middle level
(D) Machine level

28. Which escape character can be used to beep from speaker in C ?
(A) \a
(B) \b
(C) \n
(D) \m

29. The declaration **float a, b;** occupies _____ of memory.

(A) 1 byte

(B) 4 bytes

(C) 8 bytes

(D) 16 bytes

30. Which of the following special symbols is allowed in a variable name ?

(A) * (asterisk)

(B) | (pipeline)

(C) - (hyphen)

(D) _ (underscore)

31. If a field **A** is solenoidal, which of these is true ?

(A) curl **A** = 0

(B) div **A** = 0

(C) curl **A** $\neq$ 0

(D) div **A** $\neq$ 0

32. Each of the following pairs consists of an electric circuit term and the corresponding magnetic circuit term. Which pair is not corresponding ?

(A) V and mmf

(B) **A** and **B**

(C) I and Φ

(D) **J** and **B**

33. 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

34. The wavelength of a wave having propagation constant $\gamma = 0.1\,\pi + j0.2\,\pi$ rad/m is :

(A) 10 m

(B) 20 m

(C) 30 m

(D) 25 m

35. Which of the following antenna is designed by modifying waveguides ?

(A) Microstrip Antenna

(B) Horn Antenna

(C) Yagi-Uda Antenna

(D) Dipole Antenna

36. A frequency modulated signal has a maximum frequency deviation of 50 Hz for an input sinusoid of unit amplitude and frequency of 120 Hz. The required frequency multiplication factor to produce a maximum frequency deviation of 20 kHz, when input sinusoid has a unit amplitude and a frequency of 240 Hz will be :

(A) 20

(B) 40

(C) 200

(D) 400

37. The most power efficient modulation technique among MPAM, MPSK, MQAM and MFSK is :

(A) MPAM

(B) MPSK

(C) MQAM

(D) MFSK

38. One of the main function of RF amplifier in SHRR is to :

(A) Provide improved tracking

(B) Permit better adjacent channel rejection

(C) Improve rejection of image frequency

(D) Increase tuning range of the receiver

39. Companding is used :

(A) To overcome quantization noise in PCM

(B) Iin PCM transmitter, to allow amplitude limiting in the receiver

(C) To protect small signals in PCM from quantizing distortion

(D) In PCM receiver to overcome impulse noise

40. The Nyquist sampling rate for the signal

$g(t) = \sin c(100t) + 3 \sin c^2 (150t)$ is :

(A) Infinity

(B) 150 Hz

(C) 300 Hz

(D) 500 Hz

41. The advantage of using TRIAC over electro-mechanical relay is :

(A) Zero-crossing turn-on naturally provided by the TRIAC

(B) No moving parts to wear

(C) Less DC drive current required

(D) None of the above

42. In a buck converter :

(A) The average output voltage is more than the input voltage.

(B) The average output voltage is exactly double of input voltage.

(C) The average output voltage is less than the input voltage.

(D) None of the above

43. Synchronous motors are generally not self-starting because :

(A) The direction of rotation is not fixed

(B) The direction of instantaneous torque reverses after half cycle

(C) Starting winding is not provided on the machines

(D) None of the above

44. Fibres have numerical aperture (NA) in the range of 0.15 to 0.40. Fibres with NA beyond this range generally exhibit :

(A) Reduced losses

(B) High bandwidth

(C) Reduced losses and low bandwidth

(D) Greater losses and low bandwidth

45. The reverse saturation current of a solar cell is I_O and light generated short circuit current is I_L for one illumination. Under one sun illumination, open circuit voltage of the solar cell is given by :

(A) $\frac{kT}{q} \ln\left(1 + \frac{I_L}{I_O}\right)$

(B) $\frac{q}{kT} \ln\left(1 + \frac{I_L}{I_O}\right)$

(C) $\frac{kT}{q} \ln\left(I_O + I_L\right)$

(D) $\frac{kT}{q} \ln\left(I_O - I_L\right)$

46. The machine used for recording the electrical activity of the muscles is :

(A) ECG

(B) EMG

(C) EEG

(D) None of these

47. An AC bridge used for the measurement of dielectric loss of a capacitor is :

(A) Schering

(B) Maxwell

(C) Anderson

(D) Hay

48. The response of a second order control system to a step input is

$c(t) = 1.66e^{-8t} \sin(6t + 37^{o})$, the damping factor is :

(A) 0.4

(B) 0.6

(C) 0.8

(D) 1.0

49. For the Nyquist plot, if the number of encirclements of the $-1 + j0$ point in the G(s)H(s)-plane is 2 with clock wise direction, for the system having its open-loop transfer function G(s)H(s) = 10/(s(s + 3) (s^2 + s + 1)), then the closed-loop system is :

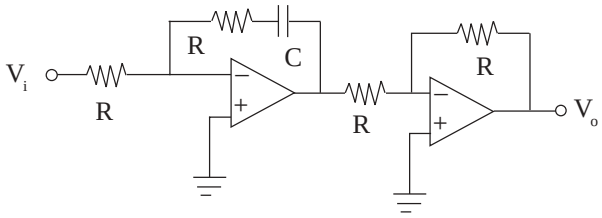
(A) Stable

(B) Unstable

(C) Critically stable

(D) Conditionally stable

50. What type of controller the following circuit realizes ?



(A) PI

(B) PD

(C) PID

(D) None of these

ROUGH WORK

ROUGH WORK

ROUGH WORK

ROUGH WORK