

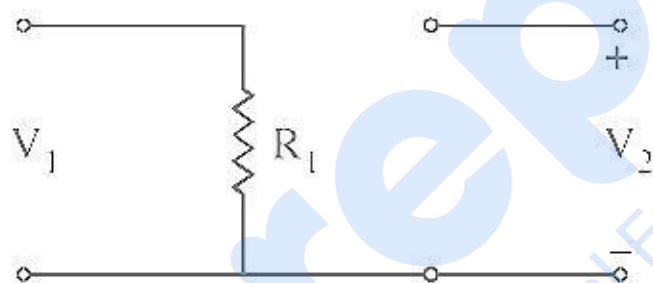
UGC NET PAPER 2 JANUARY 22, 2017 SHIFT 1 ELECTRONIC SCIENCE QUESTION PAPER

Note : This paper contains **fifty (50)** objective type questions of **two (2)** marks each. All questions are compulsory.

1. The ionised concentration for donors is given by :

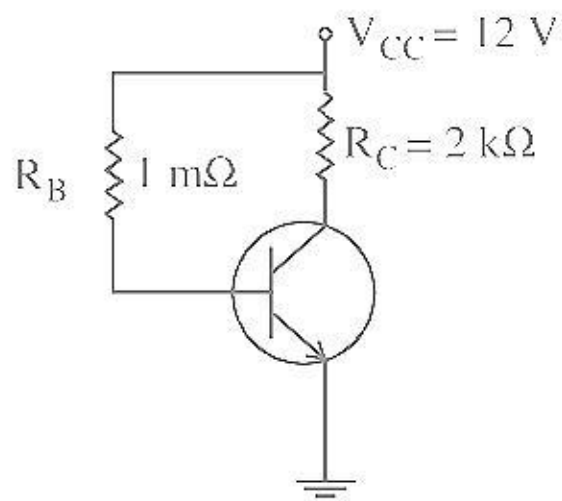
- (1) $\frac{N_D}{1 + 2 \exp [(E_F - E_D) / KT]}$ (2) $\frac{N_D}{1 - 2 \exp [(E_F - E_D) / KT]}$
- (3) $\frac{N_D}{1 + \exp [(E_F - E_D) / KT]}$ (4) $\frac{N_D}{1 - \exp [(E_F - E_D) / KT]}$

2. The [Y] parameters of the network shown below are given as :



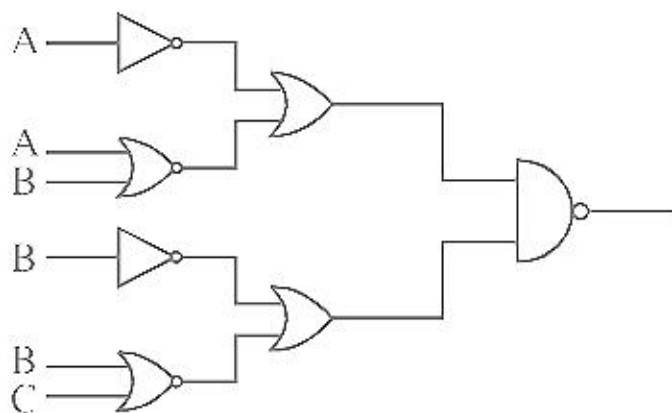
- (1) $\begin{bmatrix} \frac{1}{R_1} & \frac{1}{R_1} \\ \frac{1}{R_1} & \frac{1}{R_1} \end{bmatrix}$ (2) $\begin{bmatrix} 0 & \frac{1}{R_1} \\ \frac{1}{R_1} & \frac{1}{R_1} \end{bmatrix}$
- (3) $\begin{bmatrix} \frac{1}{R_1} & 0 \\ 0 & 0 \end{bmatrix}$ (4) $\begin{bmatrix} \frac{1}{R_1} & 0 \\ 0 & \frac{1}{R_1} \end{bmatrix}$

3. In a circuit shown below, the base current is



- (1) 12.0 μ A (2) 11.3 μ A
- (3) 6.0 μ A (4) 0.7 μ A

4. The output of the circuit is given by :



- (1) $A + C$ (2) $B + C$
 (3) $A + B$ (4) $A + \bar{C}$

5. For queue to be idle state in 8086

- (1) $QS_0 = 0, QS_1 = 0$ (2) $QS_0 = 1, QS_1 = 0$
 (3) $QS_0 = 0, QS_1 = 1$ (4) $QS_0 = 1, QS_1 = 1$

6. Which of the following is incorrect reference to the array in FORTRAN :

- (1) $A(2, 5)$ (2) $A(2 * 3, 6)$
 (3) $A(N, X)$ (4) $A(\text{LOCATION}, 8)$

7. The normalized impedance of a transmission line is given by expression :

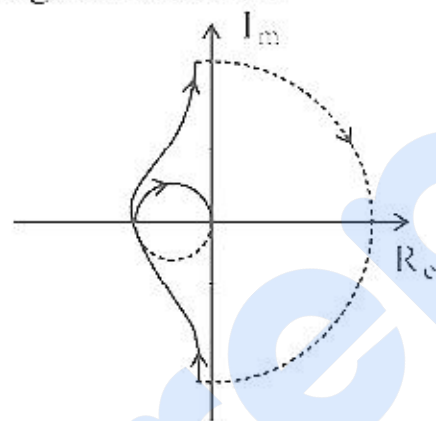
- (1) Z_O / Z_{in} (2) $\sqrt{Z_{SC} \cdot Z_{OC}}$
 (3) $Z_O \cot \gamma_L$ (4) $\frac{|V_{\max}|}{|I_{\max}| \cdot Z_O}$

8. Which of the following is associated with single balanced modulator circuit :

- (1) Single side band transmission
 (2) double side band transmission
 (3) Vestigial side band transmission
 (4) Double side band with full carrier transmission

9. A f_m kc / s modulating frequency provides $M_f = 2$ (significant Bessel functions i.e. $n = 4$) in F.M. Wave. What bandwidth is required for passing this wave keeping Δf constant, if frequency of modulating signal is doubled what will be its effect on M_f ?
- (1) M_f would be doubled
 - (2) M_f would remain unchanged
 - (3) M_f would reduce to $\frac{1}{2}$ of original value
 - (4) M_f would reduce to $\frac{1}{4}$ of original value

10. The Nyquist plot of a system is given below :



The system is of type

- (1) Zero system
 - (2) One system
 - (3) Two system
 - (4) Three system
11. In a half wave rectifier the open circuit voltage from the secondary of the transformer is $V_S = V_m \sin \omega t$, then the peak value of load current will be (R_f is dynamic resistance of diode and R_S is resistance of transformer secondary)

- (1) $\frac{V_m}{R_L + R_S}$
- (2) $\frac{V_m}{R_S + R_f + R_L}$
- (3) $\frac{V_m}{R_f + R_S - R_f}$
- (4) $\frac{V_m}{R_L - R_f - R_S}$

12. Read the following statements regarding a typical filter.

- (a) The characteristic impedance of a filter must be chosen such that the filter may be fit into a given line.
- (b) The cutoff frequency of a filter demarcates the pass-band and the stop-band.
- (c) A typical filter must have very high attenuation in the pass band.
- (d) A typical filter must have very low attenuation in stop-band.

Which of the above statements are correct :

- (1) (a) and (b) are correct
- (2) (b) and (c) are correct
- (3) (c) and (d) are correct
- (4) (b) and (d) are correct

13. The voltage gain of a bipolar junction transistor in common emitter configuration is :

- (a) $-\frac{h_{fe}R_L}{h_{ie}}$ (b) $-h_{fe}R_L$
 (c) $-\frac{h_{fe}R_L}{R_i}$ (d) $1 - \frac{h_{ie}}{R_i}$

Of the above statement :

- (1) (a) is correct but (b) is wrong. (2) (b) and (c) are correct.
 (3) (c) is correct but (d) is wrong. (4) (c) and (d) are correct.

14. The binary number 1 1 0 0 1 1 is to be converted to gray code. The number of gates and type of gates required are :

- (a) AND gate (b) 6 gates
 (c) XOR gate (d) 5 gates

The correct answer is :

- (1) (a) and (b) (2) (b) and (c)
 (3) (c) and (d) (4) (a) and (d)

15. In microprocessor 8086

- (a) The 8086 is a 16 bit processor with 16 bit internal and external data bus.
 (b) The instruction queue (IQ) length is of 4 bytes.
 (c) While entering HLT in minimum mode ALB is delayed.
 (d) The control pin in 8086 is $M\overline{IO}$

Out of the following which one is correct :

- (1) (a) and (b) are correct. (2) (a) and (c) are correct.
 (3) (a) and (d) are correct. (4) (b) and (d) are correct.

16. Operation 'a = a * b + a' can also be written as :

- (a) $a * = b + 1$;
 (b) $(a * b) ! = (b + a)$;
 (c) $a = (b + 1) * a$;
 (d) $a * = b + a$

- (1) (a) and (d) are correct. (2) (b) and (c) are correct.
 (3) (c) and (d) are correct. (4) (a) and (c) are correct.

17. A lossless line has a characteristic impedance of 50 ohms. It is terminated in a load resistance of 75 ohms. The line is energised by a generator which has an output impedance of 50 ohms and an output voltage of 30 V (rms). The line is assumed to be 2.25 wavelength long. The input impedance and instantaneous load voltages are given :

- (a) $Z_{in} = 50$ ohms
- (b) V_L (instantaneous) = 36 V
- (c) $Z_{in} = 33.33$ ohms
- (d) V_L (instantaneous) = 12 V

Which of the above are correct :

- (1) (a) and (b)
- (2) (b) and (c)
- (3) (c) and (d)
- (4) (a) and (d)

18. Which of the following statements are incorrect :

- (a) In a frequency modulation system, the frequency of the carrier wave is varied in accordance to the frequency of the modulating signal.
- (b) In PAM, there is a greater peak power compared to conventional amplitude modulation systems.
- (c) In a PCM, the sampled amplitude is directly taken for conversion to a code of pulses.
- (d) The noise in a PCM system is reduced by increasing the number of quantising levels.

Options :

- (1) (a) and (b)
- (2) (c) and (d)
- (3) (b) and (d)
- (4) (a) and (c)

19. Which of the following statements are correct :

- (a) ASK gives a maximum probability of error.
- (b) FSK is also known as ON-OFF keying.
- (c) In DPSK, no synchronous carrier is needed at the receiver.
- (d) Probability of Error in DPSK is less than BPSK.

Options :

- (1) (a), (c) and (d) are correct.
- (2) (a) and (c) are correct.
- (3) (a), (b) and (d) are correct.
- (4) (b) and (d) are correct.

20. Read the following rules to sketch the root loci using poles and zeroes of $G(s)H(s)$.

- (a) The root loci starts at the poles ($K = 0$).
- (b) The root loci ends at the poles ($K = \infty$).
- (c) The root loci ends at the zero ($K = \infty$).
- (d) The root loci starts at the zero ($K = 0$).

Which of the above rules are correct ?

- (1) (a) and (b) are correct.
- (2) (b) and (c) are correct.
- (3) (a) and (c) are correct.
- (4) (b) and (d) are correct.

21. Match the following lists :

List – I

- a. Junction depth
- b. Junction built in voltage
- c. Charge neutrality condition
- d. Law of mass action

List – II

- i. $N_A x_1 = N_D x_2$
- ii. $\sqrt{\frac{2\epsilon_{si}}{qN_A}} \phi_0$
- iii. $\frac{kT}{q} \ln \left(\frac{N_A N_D}{n_i^2} \right)$
- iv. $n.p = n_i^2$

Codes :

- | | a | b | c | d |
|-----|-----|-----|-----|----|
| (1) | ii | iii | iv | i |
| (2) | i | ii | iii | iv |
| (3) | iii | i | ii | iv |
| (4) | ii | iii | i | iv |

22. Match the following lists :

List – I

- a. 1
- b. $u(t)$
- c. $\delta(t)$
- d. $|t|$

List – II

- i. $\pi\delta(\omega) + \frac{1}{j\omega}$
- ii. 1
- iii. $\frac{-2}{\omega^2}$
- iv. $2\pi\delta(\omega)$

Codes :

- | | a | b | c | d |
|-----|----|-----|-----|-----|
| (1) | iv | i | ii | iii |
| (2) | iv | ii | iii | i |
| (3) | ii | iii | iv | i |
| (4) | ii | i | iv | iii |

23. Match the following lists :

List – I

List – II

- | | |
|---------------------|-------------------------|
| a. William Shockley | i. BJT |
| b. Kilby | ii. Tunnel diode |
| c. Essaki | iii. Integrated circuit |
| d. Lilleanfield | iv. MOSFET |

Codes :

- | | a | b | c | d |
|-----|-----|-----|-----|----|
| (1) | i | ii | iii | iv |
| (2) | i | iii | ii | iv |
| (3) | ii | iii | iv | i |
| (4) | iii | iv | i | ii |

24. Match the following lists :

List – I

List – II

- | | |
|------------|----------------------------|
| a. IC 7400 | i. Quad 2-input NOR gate |
| b. IC 7402 | ii. Quad 2-input AND gate |
| c. IC 7408 | iii. Quad 2-input OR gate |
| d. IC 7432 | iv. Quad 2-input NAND gate |

Codes :

- | | a | b | c | d |
|-----|-----|-----|----|-----|
| (1) | iv | ii | i | iii |
| (2) | iv | i | ii | iii |
| (3) | iii | ii | i | iv |
| (4) | iv | iii | ii | i |

25. Match the following lists in 8255 :

List – I	List – II
(Port/Control Register)	(Address)
a. Control Register	i. 01
b. Port A	ii. 00
c. Port B	iii. 10
d. Port C	iv. 11

Codes :

	a	b	c	d
(1)	iv	i	iii	ii
(2)	iv	ii	i	iii
(3)	i	iii	ii	iv
(4)	iii	ii	iv	i

26. Match the following vertical control characters in FORTRAN with their effects :

List – I	List – II
a. ␣ (blank)	i. Overprint
b. 0 (zero)	ii. Eject page
c. 1 (one)	iii. Double space
d. + (plus)	iv. Single space

Codes :

	a	b	c	d
(1)	i	iv	iii	ii
(2)	ii	i	iv	iii
(3)	iii	ii	i	iv
(4)	iv	iii	ii	i

27. Match the following lists in terms of relative permittivity :

List – I	List – II
a. Air	i. 25
b. Alcohol (Ethyl)	ii. 4 to 7
c. Glass	iii. 80
d. Fresh water	iv. 1

Codes :

	a	b	c	d
(1)	iv	ii	i	iii
(2)	iv	i	iii	ii
(3)	iii	i	iv	ii
(4)	iv	i	ii	iii

28. Match the following :

List – I	List – II
(Digital Modulation System)	(Probability of Error)
a. ASK	i. $\frac{1}{2} \exp\left[\frac{-A_c^2 T_b}{2N_0}\right]$
b. PSK	ii. $Q\sqrt{\frac{A_c^2 T_b}{2N_0}}$
c. FSK	iii. $Q\sqrt{\frac{A_c^2 T_b}{4N_0}}$
d. DPSK	iv. $Q\sqrt{\frac{A_c^2 T_b}{N_0}}$

Codes :

	a	b	c	d
(1)	ii	iii	iv	i
(2)	iii	iv	ii	i
(3)	iv	iii	i	ii
(4)	iv	i	ii	iii

29. Match the following lists :

List – I

List – II

- | | |
|---|--|
| a. $\pi a \cdot NA / \lambda$ | i. attenuation factor (dB/km) |
| b. $10 \log_{10} \left(\frac{P_{in}}{P_{out}} \right)$ | ii. Intermodal time delay |
| c. $\frac{1}{L} \frac{dtg}{d\lambda}$ | iii. Dispersion causing pulse spreading |
| d. $\frac{L(n_1 - n_2)n_1}{n_2 c}$ | iv. Number of modes produced by an optical fibre |

Codes :

- | | | | | |
|-----|-----|-----|-----|----|
| | a | b | c | d |
| (1) | ii | iii | i | iv |
| (2) | iv | ii | iii | i |
| (3) | iv | i | iii | ii |
| (4) | iii | i | iv | ii |

30. Match the following lists :

List – I

List – II

- | | |
|-------------|-------------------------------|
| a. Lag | i. Increase bandwidth |
| b. Lead | ii. Attenuation |
| c. Lag lead | iii. Increases damping factor |
| d. Rate | iv. Second order |

Codes :

- | | | | | |
|-----|-----|----|----|-----|
| | a | b | c | d |
| (1) | iii | i | iv | ii |
| (2) | ii | i | iv | iii |
| (3) | ii | iv | i | iii |
| (4) | iii | iv | i | ii |

Directions : Q. Nos. (31 to 40) :

The following items consist of two statements, one labelled as “Assertion (A)” and the other labelled as the “Reason (R)”. You are to examine the two statements carefully and decide if the Assertion (A) and the Reason (R) are individually true and if so whether the reason is a correct explanation of the assertion. Select your answer to these items using the codes given below and mark your answer accordingly.

Codes :

- (1) Both (A) and (R) are true and (R) is correct explanation of (A).
- (2) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- (3) (A) is true, but (R) is false.
- (4) (A) is false, but (R) is true.

31. **Assertion (A) :** The value of thin film resistor can be changed even after fabrication.

Reason (R) : This is done by means of trimming.

32. **Assertion (A) :** Network analysis based on the state equations is known as state variable method of analysis.

Reason (R) : The first order differential equation is easily programmed for computer solution.

33. **Assertion (A) :** Tunnel diode is used as rectifier.

Reason (R) : The tunnel diode is made of degenerate semiconductors.

34. **Assertion (A) :** A decoder is dissimilar to a demultiplexer.

Reason (R) : There is no data input in a decoder.

35. **Assertion (A) :** For data transfer between 8085 microprocessor and memory, \overline{CE} input of memory is connected to IO/\overline{M} of microprocessor.

Reason (R) : Microprocessor is enabled for data transfer when IO/\overline{M} goes high.

36. **Assertion (A) :** The following program code in C

```
# include <stdio.h>
struct tryit
{
    char *str;
    int i;
} t;
int main ( )
{
    scanf("%s %d", t.str, &t.i);
    printf ("%s\n", t.str);
    return 0;
}
```

will cause compile time error.

Reason (R) : When pointer is not initialized then it holds garbage value.

37. **Assertion (A) :** In an impatt diode, for a transit angle larger than π and approaching $3\pi/2$, the negative resistance of the diode increases rapidly.

Reason (R) : The IMPATT diode consists of a high doping avalanche regions followed by a drift region.

38. **Assertion (A) :** A PI controller introduces a pole in the system thereby increasing the order and type of system by one.

Reason (R) : The increase in the type of the system ensures a decrease in the steady state error of the system.

39. **Assertion (A) :** Broadband techniques are used for communication of signals whether analog or digital.

Reason (R) : Broadband techniques are used when signals are incompatible with the baseband transmission media.

40. **Assertion (A) :** Attenuation and dispersion have negative effects on the propagation of signal in the optical fibres.

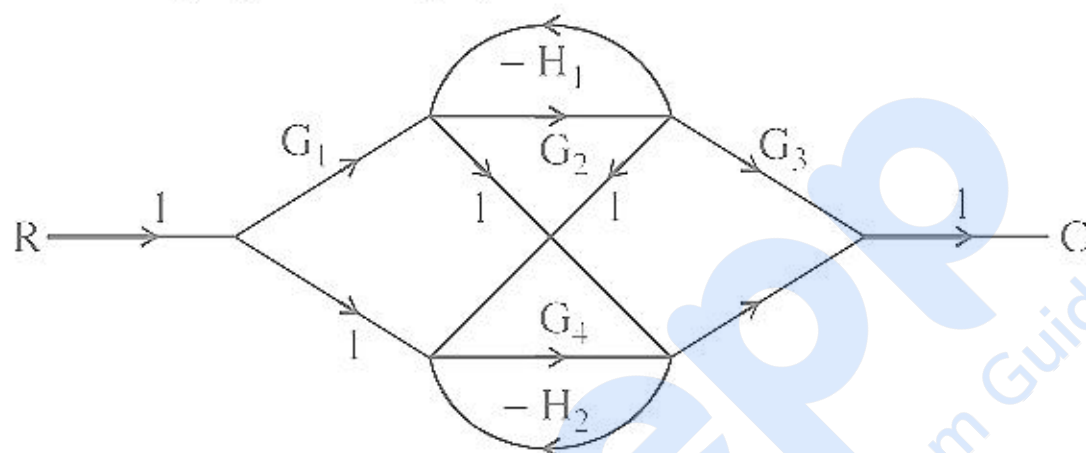
Reason (R) : Optical signal degradation is caused due to structural imperfections of the fibre material.

41. The following materials are given, arrange them in ascending order of their band gap :

- (a) Germanium
- (b) Carbon (diamond)
- (c) Silicon carbide
- (d) Aluminium Nitride

- (1) (a), (c), (b), (d)
- (2) (a), (b), (c), (d)
- (3) (b), (c), (d), (a)
- (4) (c), (d), (a), (b)

42. Consider the following signal flow graph.



Assume that

A is number of forward paths

B is number of feedback loops

C is number of touching loops

Arrange A, B and C in decreasing order :

- (1) $C > B > A$
- (2) $B > C > A$
- (3) $A > B > C$
- (4) $C > A > B$

43. Arrange the following services in the ascending order of their interrupt number in 'C' :

- (a) Keyboard service
- (b) Print screen service
- (c) Video display service
- (d) Memory size service

The correct order of sequence is :

- (1) (a), (b), (c), (d)
- (2) (b), (c), (d), (a)
- (3) (c), (d), (b), (a)
- (4) (d), (a), (b), (c)

44. Following materials are given, arrange them in ascending order of conductivity :

- (a) Sea water
- (b) Graphite
- (c) Bronze
- (d) Tungsten

The correct sequence is :

- (1) (a), (c), (d), (b)
- (2) (b), (a), (c), (d)
- (3) (a), (b), (c), (d)
- (4) (d), (b), (c), (a)

45. Arrange the below mentioned transmission lines in order of their increasing frequency handling capabilities :

- | | |
|---------------------------|------------------------------|
| (a) wave guide | (b) Parallel wire |
| (c) Rigid co-axial cables | (d) Flexible co-axial cables |

Options :

- | | |
|------------------------|------------------------|
| (1) (b), (d), (c), (a) | (2) (b), (c), (d), (a) |
| (3) (c), (d), (b), (a) | (4) (c), (b), (d), (a) |

Read the below passage and answer the question nos. 46 – 50 :

Antennas are used for receiving and transmitting the electromagnetic signals. Their size depends upon the operating frequency / wavelength. Higher is the frequency, lower is the size of antenna. They work on Maxwell equations for field theory. They are of various types for different applications like TV transmission, AM transmission, FM transmission and satellite transmission. The waves travel in free space.

46. The free space wave number ' k_0 ' is defined as

- | | |
|---|---|
| (1) $k_0 = W_0 \sqrt{\mu_0 \epsilon_0}$ | (2) $k_0 = W_0 \sqrt{\mu_0 / \epsilon_0}$ |
| (3) $k_0 = W_0 / \sqrt{\mu_0 \epsilon_0}$ | (4) $k_0 = W_0 / \sqrt{\epsilon_0 / \mu_0}$ |

47. The standard reference antenna for the directive gain is :

- | | |
|--------------------------|-----------------------|
| (1) Infinitesimal dipole | (2) Isotropic antenna |
| (3) Elementary dipole | (4) Half wave dipole |

48. If E_S is the field intensity vector identified as a phasor by its subscript 'S' and k_0 is the wave number, equation

$\nabla^2 E_S = -k^2 E_S$ is known as :

- | | |
|-------------------------------|------------------------|
| (1) Vector Helmholtz equation | (2) Poisson's equation |
| (3) Coulombs gauge equation | (4) Diffusion equation |

49. For a half wave dipole the directivity 'D' in dB is of the order of :

- | | |
|-------------|-------------|
| (1) 1.76 dB | (2) 3.14 dB |
| (3) 2.15 dB | (4) 1.64 dB |

50. Which of the following antenna is not a wideband antenna ?

- | | |
|-------------------|-------------|
| (1) Discone | (2) Helical |
| (3) Folded dipole | (4) Marconi |

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