



ACE
Engineering Academy
Leading Institute for ESE/GATE/PSUs



ESE – 2023

Preliminary Examination

QUESTIONS WITH DETAILED SOLUTIONS

ELECTRONICS & TELECOMMUNICATION ENGINEERING (SET-C)

ACE Engineering Academy has taken utmost care in preparing the **ESE-2023** Examination solutions. Discrepancies, if any, may please be brought to our notice. ACE Engineering Academy do not owe any responsibility for any damage or loss to any person on account of error or omission in these solutions. ACE Engineering Academy is always in the fore front of serving the students, irrespective of the examination type (**GATE/ESE/IRMS/SSC/RRB/PSUs/PSC/GENCO/TRANSCO etc.,**).

All Queries related to **ESE-2023** Solutions are to be sent to the following email address **help@ace.online**

☎ **+91- 779999 6602**

www.ace.online | www.aceenggacademy.com



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)



ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 1 ::

SUBJECTWISE WEIGHTAGE

S.No.	Name of the Subject	No. Of Questions
1	Analog & Digital Communication Systems	14
2	Control Systems	13
3	Signals & Systems	5
4	Computer organization & Architecture	14
5	Electro Magnetics	22
6	Advanced Electronics Topics	5
7	Advanced Communication Topics	2
8	Basic Electronics Engineering	16
9	Basic Electrical Engineering	5
10	Materials Science	5
11	Electronic Measurements & Instrumentation	8
12	Network Theory	18
13	Analog & Digital Circuits	23
Total No. Of Questions		150

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 2 ::

01. By considering standard notations, in a worst-case scenario, the total load capacitance C_L of gate Y depends upon the data activities on the neighboring signals and varies between which one of the following bounds?

- (a) $C_{GND} \leq C_L \leq C_{GND} + 4C_C$
- (b) $C_{GND} \leq C_L \leq C_{GND} + 2C_C$
- (c) $C_{GND} \leq C_L \leq C_{GND} + C_C$
- (d) $C_{GND} \leq C_L \leq 2C_{GND} + C_C$

01. Ans: (a)

02. In a source follower or common drain amplifier, the voltage gain (A_V) is

- (a) $A_V = \frac{g_{m1}}{g_{m1} + g_{s1} + (g_{ds1} + g_{ds2})/2}$
- (b) $A_V = \frac{g_{ds1}}{g_{m1} + g_{s1} + (g_{ds1} + g_{ds2})}$
- (c) $A_V = \frac{g_{m1}}{g_{m1} + g_{s1} + g_{ds1} + g_{ds2}}$
- (d) $A_V = \frac{g_{m1}}{2(g_{m1} + g_{s1}) + g_{ds1} + g_{ds2}}$

02. Ans: (c)

03. Which one of the following is a program that takes an object file generated and generates a file in a binary code called COM file or EXE file?

- (a) Editor
- (b) Assembler
- (c) Loader
- (d) Debugger

03. Ans: (c)

04. Which of the following opcodes is used if the contents of the accumulator are logically ANDed

with the 8-bit data and the results are placed in the accumulator?

- (a) CALL
- (b) POP
- (c) ANI
- (d) ANA

04. Ans: (c)

05. The arrangement of a minimum number of N flip-flops can be used to construct any counter with a modulus given by the equation

- (a) $2^N - 1 \leq \text{modulus} \leq 2^{N-1}$
- (b) $2^{N-1} + 1 \leq \text{modulus} \leq 2^N$
- (c) $2^N + 1 \leq \text{modulus} \leq 2^{N+1}$
- (d) $2^{N+1} + 1 \leq \text{modulus} \leq 2^N$

05. Ans: (b)

06. For a CMOS-4000 logic family, supply voltage (V), typical propagation delay (ns), worst-case noise margin (V), speed-power product (pJ) and maximum flip-flop toggle frequency (MHz) respectively are

- (a) 15 V to 25 V, 150 ns, 1.0V, 3 pJ and 10 MHz
- (b) 15 V to 25 V, 130 ns, 1.5 V, 3 pJ and 12 MHz
- (c) 3 V to 15 V, 130 ns, 1.5 V, 5 pJ and 10 MHz
- (d) 3 V to 15 V, 150 ns, 1.0V, 5 pJ and 12 MHz

06. Ans: (c)

07. By considering standard notations, in approximate analysis of the voltage divider biasing configuration, which of the following conditions should be satisfied?

- (a) $\beta/2R_E \geq 10$
- (b) $\beta R_E \geq R_2$
- (c) $\beta R_E \geq 10R_2$
- (d) $\beta 2R_E \geq R_2$

07. Ans: (c)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad - 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

AST

ACE SCHOLARSHIP TEST

A National Level Scholarship Test For Engineers

ESE | GATE | PSUs - 2024/25

Exam Date: **5th MARCH' 2023** | Exam Time: **11:00 AM - 12:30 PM**

Last Date to Registration: **3rd MARCH' 2023**



No. of Questions: 50

(25Q: 1 Mark, 25Q: 2 Marks)

Total: 75 Marks

Duration: 90 Mins.

- A.I. based proctoring examination.
- Candidates can take the online test from any location. Using a Laptop/PC with a connected webcam and good internet connection.

CE | ME | EC | EE | CS | IN | PI

Scan for Registrations



Fee: Rs.100/- only

1st Position 75% OFF*

2nd Position 60% OFF*

3rd Position 50% OFF*

4th Position 30% OFF*

5th Position 20% OFF*

Get Register & Avail
10% OFF* →

ace.online/ast-2023

☎ **7799996602** | www.ace.online | www.aceenggacademy.com



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)



**ace
online**

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 3 ::

08. The power dissipation under constant field after scaling on MOS device characteristics is

- (a) $\frac{P}{S}$ (b) $\frac{2P}{S^2}$
(c) $\frac{P}{S^2}$ (d) $\frac{P}{2S^2}$

08. Ans: (c)

09. Source/Drain region's doping concentration value used for analysis and simulation of short-channel SOI MESFET is

- (a) 10^{10} cm^{-3} (b) 10^{20} cm^{-3}
(c) 10^{15} cm^{-3} (d) 10^{25} cm^{-3}

09. Ans: (b)

Directions :

Each of the next six (06) items consists of two statements, one labelled as 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the code given below.

Code :

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
(b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)
(c) Statement (I) is true but Statement (II) is false
(d) Statement (I) is false but Statement (II) is true

10. **Statement (I):** Content in the flag register in 8085 microprocessor is read by PUSH PSW followed by POP instruction.

Statement (II): Content in the flag register in 8085 microprocessor is not able to read and store to any general purpose register.

10. Ans: (a)

11. **Statement (I) :** Pipeline processing cycle overlaps computer instruction cycle in execution for the performance improvement.

Statement (II): Pipelining is a technique of decomposing a sequential process into sub-operations, with each sub process being executed in a special dedicated segment that operates concurrently with all other segments.

11. Ans: (a)

12. **Statement (I):** A popular method for generating a VSB modulated wave is to use the frequency discrimination method.

Statement (II): One of the sidebands is partially suppressed and a vestige of the other sideband is transmitted to compensate for that suppression.

12. Ans: (a)

13. **Statement (I):** The differential amplifier is said to operate in common-mode configuration when the same voltage is applied to both the input terminals.

Statement (II): The ability of a differential amplifier to accept a common-mode signal is defined as the figure of merit.

13. Ans: (c)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 4 ::

14. **Statement (I):** The set-up time and hold time are met, the data at the D input is copied to the Q output after a worst-case propagation delay denoted by t_{c-q} .

Statement (II): The set-up time is the time the data input must be valid before the clock transition and the hold time is the time the data input must remain valid after the clock edge. Critical path is the longest data path.

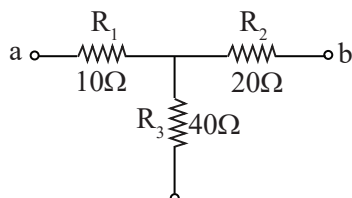
14. **Ans: (b)**

15. **Statement (I) :** In the sampling and quantizing operations, errors are introduced into the digital signal. These errors are reversible and it is possible to produce an exact replica of the original analog signal from its digital representation.

Statement (II) : The use of digital communication offers flexibility and compatibility in that the adoption of a common digital format makes it possible for a transmission system to sustain many different sources of information in a flexible manner.

15. **Ans: (d)**

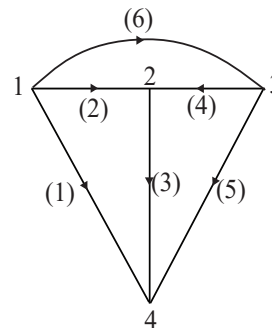
16. What are the values of delta-connected branch resistances R_{ab} , R_{bc} and R_{ca} of the star-connected network shown in the figure using star to delta transformation respectively?



- (a) $35\ \Omega$, $140\ \Omega$ and $70\ \Omega$
(b) $35\ \Omega$, $60\ \Omega$ and $70\ \Omega$
(c) $70\ \Omega$, $60\ \Omega$ and $35\ \Omega$
(d) $70\ \Omega$, $150\ \Omega$ and $35\ \Omega$

16. **Ans: (a)**

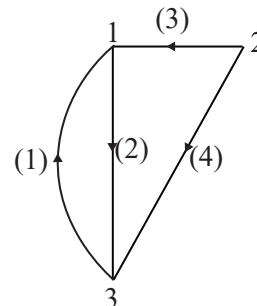
17. What is the value of number of possible trees of the graph shown in the figure?



- (a) 14
(b) 16
(c) 18
(d) 20

17. **Ans: (b)**

18. Which one of the following is a fundamental cut set of the graph shown in the figure?



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

18. **Ans: (a & b)**

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams



SELF-PACED PROGRAM

Learn at your own pace with the video curated by India's #1 faculty. With limitless watch time, prepare any time from anywhere. Enhance your preparation with free Live Doubt Clearing sessions and Online Test Series.

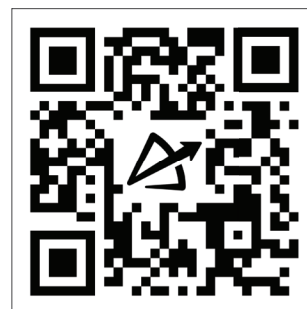
For **ESE | GATE | PSUs | SSC-JE | RRB-JE** curated by India's best minds. Access courses through Mobile / Tablet / Laptop / Desktop from anywhere. We have subscription options of 1, 3, 6, 12, 18 & 24 months.

Course Details	Hours	Course Details	Hours
GATE + PSUs (English)	650 +	APPSC - AE (Tech. P-II)	100 +
GATE + PSUs (Hinglish)	650 +	QRC (CSE)	250 +
ESE: General Studies	250 +	PYQS of GATE & ISRO* (CSE)	150 +
ESE + GATE + PSUs	1000 +	KPTCL - AE - Tech., (EE)	500 +
SSC-JE : Technical (CE/EE/ME)	400 +	TSPSC - AEE (EE)	500 +
SSC-JE : GS	200 +	TSPSC Groups- 1(P), 2, 3 & 4	500 +
APPSC/TSPSC-AEE-Tech. (CE)	500 +	MPPEB (VYAPAM)	500 +
APPSC/TSPSC-AEE/AE: GS	350 +	TNPSC - AE (CE)	600 +
GENCO/TRANSCO/DISCOMs: EE	550 +	RRB - JE (EE)	400 +
APPSC GROUPS - 1 (p)	500 +	Asst. Motor Vehicle Inspector	400 +
MAHATRANSCO	450 +	Campus Edge - B.Tech Subjects	

Salient Features

- Experienced Faculty
- Free Online Test Series
- Live Doubt Clearance
- Preparation Strategy
- Self Assessment Tests
- Ask An Expert
- Free Interview Guidance
- Full Set Of Study Material
- EMI Option Available
- Learning With 2d & 3d Animations

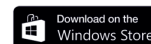
**START YOUR
7-DAY FREE TRIAL TODAY!**



USE CODE

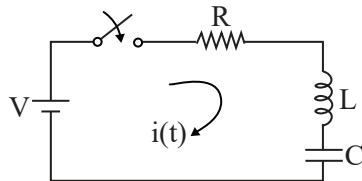
ENGG10

Get
10% OFF
On All Courses





19. For the network shown in the figure if the switch is closed at $t = 0$, and when $\frac{R}{2L} < \frac{1}{\sqrt{LC}}$, which one of the following statements is correct?



- (a) The roots are real and equal and it gives a critically damped response.
- (b) The roots are real and unequal and it gives an overdamped response.
- (c) The roots are complex conjugate and it gives an underdamped response.
- (d) The roots are real and unequal and it gives an underdamped response.

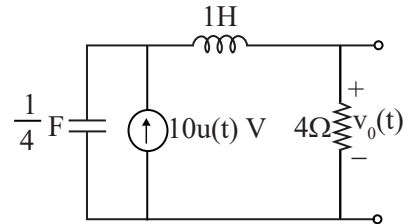
19. Ans: (c)

20. An R-L-C series circuits has $R = 4\Omega$, $L = 2H$ and $C = 2F$. What type of transient current response is offered by the circuit for step function voltage input?

- (a) Underdamped
- (b) Not possible to know the response
- (c) Critically damped
- (d) Overdamped

20. Ans: (d)

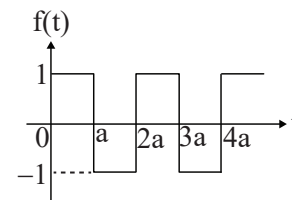
21. What is the value of $v_0(t)$ for the circuit shown in the figure, assuming zero initial conditions?



- (a) $v_0(t) = 40(1 - e^{-t} + 2te^{-t}) u(t)$ V
- (b) $v_0(t) = 40(1 - e^{-2t} - 2te^{-2t}) u(t)$ V
- (c) $v_0(t) = 40(1 - e^{-t} - 2te^{-2t}) u(t)$ V
- (d) $v_0(t) = 40(1 - e^{-2t} + 2te^{-t}) u(t)$ V

21. Ans: (b)

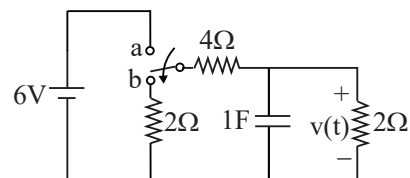
22. What is the Laplace transform of the periodic waveform shown in the figure where $a = 1$, $2a = 2$, $3a = 3$ and $4a = 4$?



- (a) $\frac{1}{s} \tanh\left(\frac{s}{2}\right)$
- (b) $\frac{1}{2s} \tanh\left(\frac{s}{2}\right)$
- (c) $\frac{1}{s} \tanh\left(\frac{1}{2}\right)$
- (d) $\frac{1}{s} \tanh\left(\frac{3}{2}\right)$

22. Ans: (a)

23. For the network shown in the figure, the switch is moved from a to b at $t = 0^-$. What is the value of voltage $v(t)$?

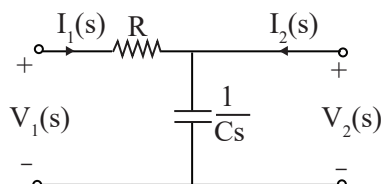




- (a) $v(t) = 2e^{-\frac{2}{3}t}$ (b) $v(t) = e^{-\frac{2}{3}t}$
(c) $v(t) = 3e^{-\frac{2}{3}t}$ (d) $v(t) = 2e^{-\frac{1}{3}t}$

23. Ans: (a)

24. What is the voltage transfer function the two-port of network shown in the figure?



- (a) $\frac{1}{1 - RCs}$ (b) $\frac{1}{1 + RCs}$
(c) $\frac{1}{(1 + RCs)^2}$ (d) $\frac{1}{(1 - RCs)^2}$

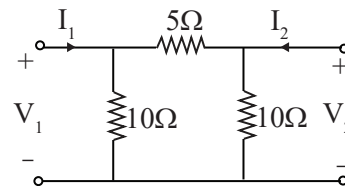
24. Ans: (b)

25. The Z-parameters of a two-port network are $Z_{11} = 2\Omega$, $Z_{12} = 1\Omega$, $Z_{21} = 10\Omega$ and $Z_{22} = 11\Omega$. The corresponding values of hybrid parameters are

- (a) $\begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} = \begin{bmatrix} \frac{12}{11} & \frac{1}{11} \\ -\frac{10}{11} & \frac{1}{11} \end{bmatrix}$
(b) $\begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} = \begin{bmatrix} \frac{1}{11} & \frac{1}{11} \\ -\frac{10}{11} & \frac{12}{11} \end{bmatrix}$
(c) $\begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} = \begin{bmatrix} \frac{12}{11} & \frac{10}{11} \\ -\frac{10}{11} & \frac{1}{11} \end{bmatrix}$
(d) $\begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} = \begin{bmatrix} \frac{12}{11} & \frac{1}{11} \\ -\frac{10}{11} & \frac{12}{11} \end{bmatrix}$

25. Ans: (a)

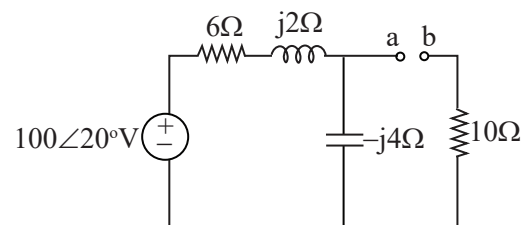
26. What are the lattice equivalent network parameters Z_A and Z_B of a symmetrical π network shown in the figure?



- (a) $Z_A = 2\Omega$ and $Z_B = 10\Omega$
(b) $Z_A = 10\Omega$ and $Z_B = 2\Omega$
(c) $Z_A = 4\Omega$ and $Z_B = 8\Omega$
(d) $Z_A = 8\Omega$ and $Z_B = 4\Omega$

26. Ans: (a)

27. What is the Thevenin equivalent impedance of the circuit of the circuit shown in the figure?



- (a) $12.4 - j3.2\Omega$
(b) $12.4 - j2.2\Omega$
(c) $11.4 - j3.2\Omega$
(d) $11.4 - j2.2\Omega$

27. Ans: (a)

28. What is the maximum conversion time for an n-bit counting ADC?

- (a) $2^n + 1$ clock cycles
(b) $2^n - 1$ clock cycles



EXCLUSIVE ONLINE LIVE CLASSES

ESE + GATE + PSUs – 2024

Regular Batches

25th Feb 2023

10th Mar 2023

26th Mar 2023

10th Apr 2023

24th Apr 2023

10th May 2023

24th May 2023

08th Jun 2023

21st Jun 2023

ESE + GATE + PSUs – 2024/2025

Long Term Batches (English & Hinglish)

25th Feb 2023

11th Mar 2023

1st April 2023

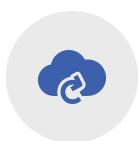
Salient Features



EXPERIENCED &
ERUDIET FACULTY



REPLICA OF
CLASSROOM



BACKUP
CLASSES



FREE ONLINE
TEST SERIES



FOCUSED & RELEVANT
STUDY MATERIAL



+91-7799996602



www.ace.online | www.aceenggacademy.com



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)



ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 7 ::

- (c) $2n - 1$ clock cycles
- (d) $2n + 1$ clock cycles

28. Ans: (b)

29. If a square wave is impressed upon either a point contact or a p-n junction germanium diode, the resistance does not change instantaneously from its forward value to its back value, or vice versa. Which one of the following is required for this change to take place?
- (a) Change-over time
 - (b) Recovery time
 - (c) Settling time
 - (d) Propagation delay time

29. Ans: (b)

30. By considering standard notations, the time period of a linear ramp generator in 555 timer is

$$(a) T = \frac{\left(\frac{1}{3}\right) V_{CC} R_E (R_1 + R_2) C}{R_2 V_{CC} - V_{BE} (R_1 + R_2)}$$

$$(b) T = \frac{V_{CC} R_E (R_1 + R_2) C}{R_1 V_{CC} - V_{BE} (R_1 + R_2)}$$

$$(c) T = \frac{\left(\frac{2}{3}\right) V_{CC} R_E (R_1 + R_2) C}{R_1 V_{CC} - V_{BE} (R_1 + R_2)}$$

$$(d) T = \frac{\left(\frac{2}{3}\right) V_{CC} R_E (R_1 + R_2) C}{R_1 V_{CC} + V_{BE} (R_1 + 2R_2)}$$

30. Ans: (c)

31. In a physical diode, there is a component of the reverse saturation current due to leakage over the surface. The reverse saturation current increase approximately 7 percent/ $^{\circ}\text{C}$ for both silicon and germanium. The relationship between T and V in V-I characteristics :
- (a) T increases and V decreases
 - (b) V decreases and T increases
 - (c) T and V both increase
 - (d) T and V both decrease

31. Ans: (a & b)

32. Which of the following is correct related to properties of good insulating material?
- (a) Having high dielectric strength, very low dissipation factor and high operating temperature limit
 - (b) Having low dielectric strength, very low dissipation factor and high operating temperature limit
 - (c) Having high dielectric strength, very high dissipation factor and low operating temperature limit
 - (d) Having low dielectric strength, very high dissipation factor and low operating temperature limit

32. Ans: (a)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

ESE + GATE + PSUs – 2024

CLASSROOM COACHING @ KOTHAPET, HYDERABAD

Regular Batches

25th Feb 2023

10th Mar 2023

26th Mar 2023

10th Apr 2023

24th Apr 2023

10th May 2023

24th May 2023

08th Jun 2023

21st Jun 2023

12th Jul 2023

22nd Jul 2023

Short Term Batches

1st May 2023

10th May 2023

24th May 2023

08th Jun 2023

21st Jun 2023

12th Jul 2023

Long Term Batches

25th Feb 2023

11th Mar 2023

Special Concessions for
IIT/NIT/IIIT &
Govt. College Students

TS & AP GENCO/TRANSCO/DISCOMs

9th Feb 2023

50% OFF for
ACE old students

APPSC / TSPSC – AEE (CE)

24th Feb 2023

50% OFF for
ACE (AEE) old students



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)



ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 8 ::

33. Which one of the following statements is correct related to long range order in ferromagnets?

- (a) A magnetic field of about 1 T can be produced in annealed iron with an external field of about 0.0002 T, a multiplication of the external field by a factor of 5000.
- (b) A magnetic field of about 1 T can be produced in annealed iron with an external field of about 0.0005T, a multiplication of the external field by a factor of 2000.
- (c) A magnetic field of about 1 T can be produced in annealed iron with an external field of about 0.0005T, a multiplication of the external field by a factor of 5000.
- (d) A magnetic field of about 1 T can be produced in annealed iron with an external field of about 0.0002 T, a multiplication of the external field by a factor of 2000.

33. Ans: (a)

34. Relative static error (ϵ_r) is

- (a) $\frac{\text{absolute error}}{2 \times \text{true value}}$
- (b) $\frac{2 \times \text{absolute error}}{\text{true value}}$
- (c) $\frac{\text{absolute error}}{\text{true value}}$
- (d) absolute error $\times$ true value

34. Ans: (c)

35. In order. to eliminate the effect of temperature variations upon the length of the spring

- (a) two springs coiled in opposite directions are used

(b) three springs coiled are added in the same direction

(c) two springs coiled in same and other two in opposite directions are used

(d) two springs coiled in same direction are used

35. Ans: (a)

36. A variation in the ambient humidity causes a variation in the resistance of the element that is usually mixture of

- (a) a hygroscopic salt, for example, lithium chloride and carbon on an insulating substrate between metal electrodes
- (b) a hygroscopic salt, for example, lithium hydroxide and aluminium. on an insulating substrate between metal electrodes
- (c) a hygroscopic salt, for example, lithium chloride and silicon on an insulating substrate between metal electrodes
- (d) a hygroscopic salt, for example, lithium chloride and nickel on an insulating substrate between metal electrodes

36. Ans: (b)

37. The typical range of dissipation factor (D) of capacitor is

- (a) 0.2 for electrolytic capacitors to less than 10^{-2} for capacitors with a plastic film dielectric
- (b) 0.1 for electrolytic capacitors to less than 10^{-4} for capacitors with a plastic film dielectric
- (c) 0.5 for electrolytic capacitors to less than 10^{-5} for capacitors with a plastic film dielectric
- (d) 0.4 for electrolytic capacitors to less than 10^{-3} for capacitors with a plastic film dielectric

37. Ans: (b)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)



ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 9 ::

38. Match the following lists :

List-I

- P. Square wave
- Q. Triangular wave
- R. Two waveforms deliver same power to identical resistors

List-II

- 1. Less harmonics
- 2. Made up of fundamental frequency plus an infinite number of odd harmonics
- 3. RMS voltages must be the same

Select the correct answer using the code given below:

- (a) P Q R
 2 1 3
- (b) P Q R
 3 1 2
- (c) P Q R
 2 3 1
- (d) P Q R
 1 2 3

38. Ans: (a)

39. One of the advantages of Ayrton shunt is that it eliminates the possibility of the meter movement being in the circuit

- (a) with limited shunt resistance
- (b) without any series resistance
- (c) without any shunt resistance
- (d) with minimum series resistance

39. Ans: (c)

40. The Poisson's ratio for most metals lies

- (a) in the range of 0.05 to 0.15
- (b) in the range of 0.15 to 0.25
- (c) in the range of 0.35 to 0.45
- (d) in the range of 0.25 to 0.35

40. Ans: (c)

41. The relation among minimum detectable signal (MDS), IF bandwidth (BW) and noise figure (NF) of a spectrum analyzer is

- (a) $MDS = -125 \text{ dBm} + 10 \log (BW/4 \text{ MHz}) + NF$
- (b) $MDS = -100 \text{ dBm} + 10 \log (BW/2 \text{ MHz}) + NF$
- (c) $MDS = -114 \text{ dBm} + 10 \log (BW/1 \text{ MHz}) + NF$
- (d) $MDS = -110 \text{ dBm} + 10 \log (BW/3 \text{ MHz}) + NF$

41. Ans: (c)

42. In the design of Digital IIR Filters by means of Bilinear Transform, the design specifications are given. Match the following lists :

List-I

- P. N and Δf fixed
- Q. Δf and δ fixed
- R. N and δ fixed

List-II

- 1. The design procedure has to start with the evaluation of the order of the filter necessary to meet the specifications in terms of the desired attenuation, transition bandwidth and pass-band deviation.
- 2. The filter is completely specified and the transition bandwidth is directly obtainable during the design procedure.
- 3. The design is completely determined for the Butterworth filter case by obtaining the value of the attenuation at f_a directly.

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad - 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

TSPSC-AE

MEGA MOCK TEST



27th FEB 2023

150 QUESTIONS | 150 MARKS

Offline Mode:

- Paper I – 10:00 AM – 12:30 PM
- Paper II – 02:30 PM – 05:00 PM



Scan QR for
Registration

Fee: Rs.100/-

CE | ME | EE



AWARDS



LUCKY
REGISTRANTS



WINNER



WINNER



WINNER



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 10 ::

Select the correct answer using the code given below .

(a) P Q R

2 3 1

(b) P Q R

3 2 1

(c) P Q R

1 2 3

(d) P Q R

3 1 2

42. Ans: (d)

43. In a rosette gauge, the angle between any two longitudinal gauge axes is

(a) 45° (b) 60°

(c) 70° (d) 85°

43. Ans: (a)

44. A chopper-stabilized amplifier circuit eliminates the effects of

(a) DC offset voltages and the drift currents only

(b) DC offset voltages only

(c) DC offset currents and the drift of other DC parameters by using an AC-coupled amplifier

(d) the drift of other AC parameters by using a DC-coupled amplifier only

44. Ans: (a)

45. The inductance of a 25 A electrodynamic ammeter - changes uniformly at the rate of 0.0035 mH/radian. The spring constant is 10^{-6} N-m/radian. What is the angular deflection at full scale approximately?

(a) 420° (b) 210°

(c) 250° (d) 125°

45. Ans: no option

46. The self-inductances of three coils are $L_A = 20$ H, $L_B = 30$ H and $L_C = 40$ H. The coils are connected in series in such a way that fluxes of L_A and L_B add, fluxes of L_A and L_C are in opposition and fluxes of L_B and L_C are in opposition. If $M_{AB} = 8$ H, $M_{BC} = 12$ H and $M_{AC} = 10$ H, what is the total inductance of the circuit?

(a) 46 H (b) 62 H

(c) 70 H (d) 82 H

46. Ans: (b)

47. A 100 kVA, 50 Hz single-phase transformer has ratio of secondary to primary turns as 0.1. The secondary voltage at no-load condition is 100 V.

What is the value of primary voltage?

(a) 100 V (b) 500 V

(c) 1000 V (d) 5000 V

47. Ans: (c)

48. A 230 V DC shunt machine has an armature resistance of 0.5Ω and a field resistance of 115Ω . What are the values of e.m.f. induced when the machine acts as a generator and acts as a motor respectively by assuming a line current of 50 A in both the cases?

(a) 256 V and 206 V (b) 206 V and 256 V

(c) 251 V and 211 V (d) 211 V and 251 V

48. Ans: (a)

49. A 4-pole; three-phase induction motor is supplied from 50 Hz AC supply and the full-load speed of the motor is 1455 r.p.m. What are the values of slip and frequency of the rotor induced e.m.f. at standstill respectively?

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad - 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online

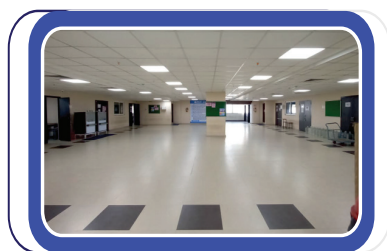


India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

CLASSROOM COACHING



- **Classroom Coaching** is an effective learning process in the live presence of faculty in a suitable learning environment.
- With the growing competition and the increasing number of students enrolling for competitive exams, ACE came up with comprehensive classroom coaching delivered by the **#1 faculty in India**.
- Our Extensive classroom program helps students to build skills and confidence.



→ **Smart Classrooms**

→ **Library/Reading Rooms**

→ **Calm Study Environment**

→ **Near To Metro Station**

→ **Centralized AC Classrooms**

ESE | GATE | IRMSE | PSU | PSC | RRB JE | SSC JE Exams

 Kinara Grand, Opp: Anutex Shopping Mall, Near Victoria Memorial Metro Station,
Metro Pillar No: CHPNP-32, 33, Kothapet, Hyderabad, Telangana – 500035.



+91-7799996602



www.ace.online | www.aceengacademy.com



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)



ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 11 ::

- (a) 0.03 and 15Hz (b) 0.03 and 50 Hz
(c) 0.06 and 50 Hz (d) 0.06 and 15Hz

49. Ans: (a)

50. The pressurized-water reactor is similar to a boiling-water reactor, except that the coolant water is pumped through the reactor under
(a) high pressure (b) low pressure
(c) moderate pressure (d) constant pressure

50. Ans: (a)

51. A discharged battery is charged at 6A for 3 hours after which it is discharged through a resistor of $R \Omega$. If the discharge period is 7 hours and the terminal voltage remains fixed at 12 V, what is the value of R approximately assuming the Ah efficiency of the battery as 85%?
(a) 3.37 Ω (b) 5.49 Ω
(c) 7.62 Ω (d) 9.72 Ω

51. Ans: (b)

52. The longest wavelength that can be absorbed by silicon, which has the band gap of 1.12 eV, is 1.1 μm . If the longest wavelength that can be absorbed by another material is 0.87 μm , then the band gap of this material is approximately
(a) 1.416 eV (b) 0.886 eV
(c) 2.854 eV (d) 3.706 eV

52. Ans: (a)

53. The band gap of germanium, at room temperature is
(a) 2.3 eV (b) 0.7 eV
(c) 1.1 eV (d) 3.4 eV

53. Ans: (b)

54. Silicon is doped with boron to a concentration of 4×10^{17} atoms/ cm^3 . Assume the intrinsic carrier concentration of silicon to be $1.5 \times 10^{10}/\text{cm}^3$ and the value of kT/q to be 25 mV at 300 K. Compared to undoped silicon, the Fermi level of doped silicon
(a) goes down by 0.13 eV
(b) goes up by 0.13 eV
(c) goes down by 0.427 eV
(d) goes up by 0.427 eV

54. Ans: (c)

55. The resistivity of a uniformly doped n-type silicon sample is 0.5 $\Omega\text{-cm}$. If the electron mobility (μ_n) is 1250 $\text{cm}^2/\text{V-sec}$ and the charge of an electron is 1.6×10^{-19} coulomb, the donor impurity concentration (N_D) in the sample is
(a) $2 \times 10^{16}/\text{cm}^3$ (b) $1 \times 10^{16}/\text{cm}^3$
(c) $2.5 \times 10^{15}/\text{cm}^3$ (d) $2 \times 10^{15}/\text{cm}^3$

55. Ans: (b)

56. A silicon sample A is doped with 10^{18} atoms/ cm^3 of boron. Another sample B of identical dimensions is doped with 10^{18} atoms/ cm^3 of phosphorus. The ratio of electron to hole mobility is 3. The ratio of conductivity of the sample A to that of sample B is
(a) 1/2 (b) 1/3
(c) 2/3 (d) 1/4

56. Ans: (b)

57. According to the Einstein relation, for any semiconductor, the ratio of diffusion constant to mobility of carriers

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

Want to Achieve Your **DREAM SCORE?**

Join ACE

ONLINE TEST SERIES 



ESE | GATE | IRMSE | PSU | PSC | RRB-JE | SSC-JE & BARC Exams

Our Features



**DETAILED
REPORT**



**FLEXIBILITY IN
PREPARATION**

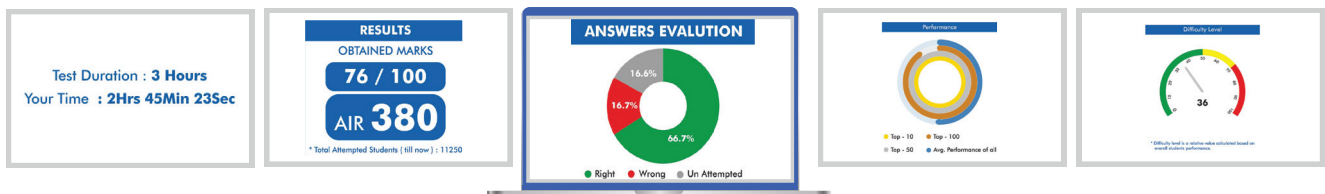


**VIDEO
SOLUTIONS**



**AIR FOR
EACH TEST**

Test wise & Question wise Statistics



www.ace.online | www.aceenggacademy.com



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 12 ::

- (a) depends upon the temperature of the semiconductor
- (b) depends upon the type of the semiconductor
- (c) varies with lifetime of the semiconductor
- (d) increases the velocity of the charge carriers

57. Ans: (a)

58. A heavily doped n-type semiconductor has the following characteristics:

Hole-electron mobility ratio : 0.4

Doping concentration : 4.2×10^8 atoms/m³

Intrinsic concentration : 1.5×10^4 atoms/m³

The ratio of conductance of the n-type semiconductor to that of the intrinsic semiconductor of same material and at the same temperature is given by

- (a) 50×10^3
- (b) 2×10^3
- (c) 10×10^3
- (d) 20×10^3

58. Ans: (b)

59. A silicon bar is doped with donor impurities $N_D = 2.25 \times 10^{15}$ atoms/cm³. Given the intrinsic carrier concentration of silicon at $T = 300$ K is 1.5×10^{10} /cm³. Assuming complete impurity ionization, the equilibrium electron and hole concentrations are respectively

- (a) $n_0 = 1.5 \times 10^{10}$ /cm³, $p_0 = 1 \times 10^5$ /cm³
- (b) $n_0 = 1.5 \times 10^{10}$ /cm³, $p_0 = 1.5 \times 10^{10}$ /cm³
- (c) $n_0 = 2.25 \times 10^{15}$ /cm³, $p_0 = 1.5 \times 10^{10}$ /cm³
- (d) $n_0 = 2.25 \times 10^{15}$ /cm³, $p_0 = 1 \times 10^5$ /cm³

59. Ans: (d)

60. In an open-circuited step-graded junction, the left-half of the bar is p-type with a constant

concentration N_A , whereas the right-half is n-type with a uniform density N_D . In this type of doping, the density changes abruptly from p-type to n-type. What is the contact difference of potential V_0 ?

- (a) 1.6021×10^{-19} J
- (b) $V_{n0} - V_{i0} = V_{nr}$
- (c) $V_{21} = V_0 = \ln(p_{p0}/p_{n0})$
- (d) $V_0 = V_T \ln(N_A N_D/n_i^2)$

60. Ans: (d)

61. By considering standard notations, in VCO, the centre frequency is

- (a) $f_0 = 2 \frac{V_+ + V_C}{V_+ R_1 C_1}$
- (b) $f_0 = 4 \frac{V_+ + V_C}{V_+ R_1 C_1}$
- (c) $f_0 = 4 \frac{V_+ - V_C}{V_+ R_1 C_1}$
- (d) $f_0 = 2 \frac{V_+ - V_C}{V_+ R_1 C_1}$

61. Ans: (d)

62. According to the properties of intrinsic semiconductors at room temperature, the intrinsic resistivity of germanium is

- (a) 25 Ω-cm
- (b) 35 Ω-cm
- (c) 45 Ω-cm
- (d) 55 Ω-cm

62. Ans: (c)

63. In Auger Recombination Process, recombination in an n-type semi-conductor involves the interaction of

- (a) two electrons and one hole
- (b) one electron and one hole
- (c) two holes and one electron
- (d) two holes and three electrons

63. Ans: (a)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad - 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 13 ::

64. In reduction in noise and nonlinear distortion, additional stages are used to bring the overall gain up to the level

- (a) without feedback, and introduce as much noise back into the system as that reduced by the feedback amplifier
- (b) with feedback, and introduce as low noise back into the system as that reduced by the feedback amplifier
- (c) without feedback, and introduce as low noise back into the system as that reduced by the feedback amplifier
- (d) with feedback, and introduce as much noise back into the system as that reduced by the feedback amplifier

64. Ans: (d)

65. The failure of the transistor to respond to the trailing edge of the driving pulse is due to

- (a) accumulation charge of excess minority carriers stored in the collector
- (b) saturation charge of excess majority carriers stored in the base
- (c) saturation charge of excess minority carriers stored in the base
- (d) recombination charge of carriers stored in the collector

65. Ans: (c)

66. By considering standard notations, for a depletion MOSFET, the SPICE parameter LAMBDA value is

- (a) $\frac{3}{V_A}$
- (b) $\frac{2}{3V_A}$
- (c) $\frac{1}{2V_A}$
- (d) $\frac{1}{V_A}$

66. Ans: (d)

67. The Nyquist criterion for stability states that an amplifier is unstable if the Nyquist curve encloses the $-1 + j0$ point, and the amplifier is stable if the curve does not enclose this point. If $A\beta$

- (a) extends outside this circle, the feedback is negative
- (b) lies within this circle, then $|1+A\beta| < 1$, and the feedback is negative
- (c) does not enclose the point $-1 + j0$, i.e., $|1+A\beta| > 1$, then the amplifier is unstable and the feedback is negative for all frequencies
- (d) extends inside this circle, the feedback is negative

67. Ans: (b)

68. Coulomb blockade can be readily observed when the single electron charging energy is larger than

- (a) the broadening r and larger than kT
- (b) the lowering r and larger than kT
- (c) the broadening r and smaller than kT
- (d) the lowering r and smaller than kT

68. Ans: (a)

69. The switching point of the SCR is controlled by the values of the two power supply resistances R_s and R_w . Adding more tub ties

- (a) equates the values of R_s and R_w
- (b) reduces the values of R_s and R_w
- (c) reduces the values of R_s and $R_w/2$
- (d) equates the values of R_s and $R_w/4$

69. Ans: (b)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



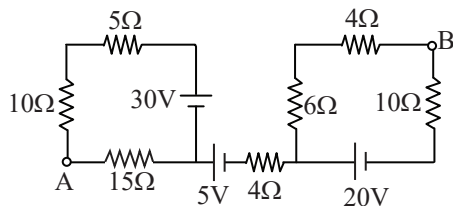
India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams



70. A coil consists of 1000 turns of copper wire having a cross-sectional area of 0.8 mm^2 . The mean length per turn is 80 cm and the resistivity of copper is $0.02 \mu\Omega\text{-m}$. What are the values of resistance of the coil and power absorbed by the coil when connected across 100 V DC supply respectively?
- (a) 20Ω and 250 W (b) 40Ω and 250 W
(c) 20Ω and 500 W (d) 40Ω and 500 W

70. Ans: (c)

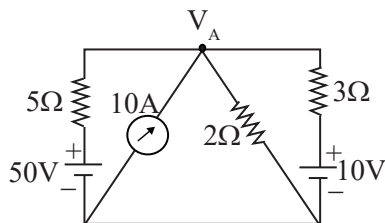
71. What is the value of voltage between point A and B of the network shown in the figure?



- (a) 15 V (b) 30 V
(c) -30 V (d) -15 V

71. Ans: (b)

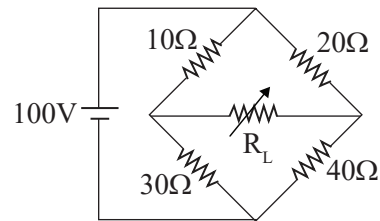
72. What is the value of voltage at node V_A shown in the network below?



- (a) 21.65 V (b) 22.65 V
(c) -21.65 V (d) -22.65 V

72. Ans: (b)

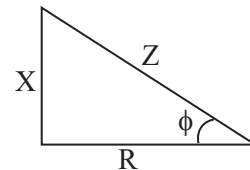
73. What is the value of resistance R_L in the circuit shown in the figure to deliver maximum power from the source to load?



- (a) 22.83Ω (b) 20.83Ω
(c) 18.83Ω (d) 16.83Ω

73. Ans: (b)

74. From the impedance triangle of an R-L series circuit fed with single-phase voltage, what is the value of power factor of the circuit?



- (a) (X/Z) lagging (b) (R/X) lagging
(c) (R/Z) lagging (d) (X/Z) leading

74. Ans: (c)

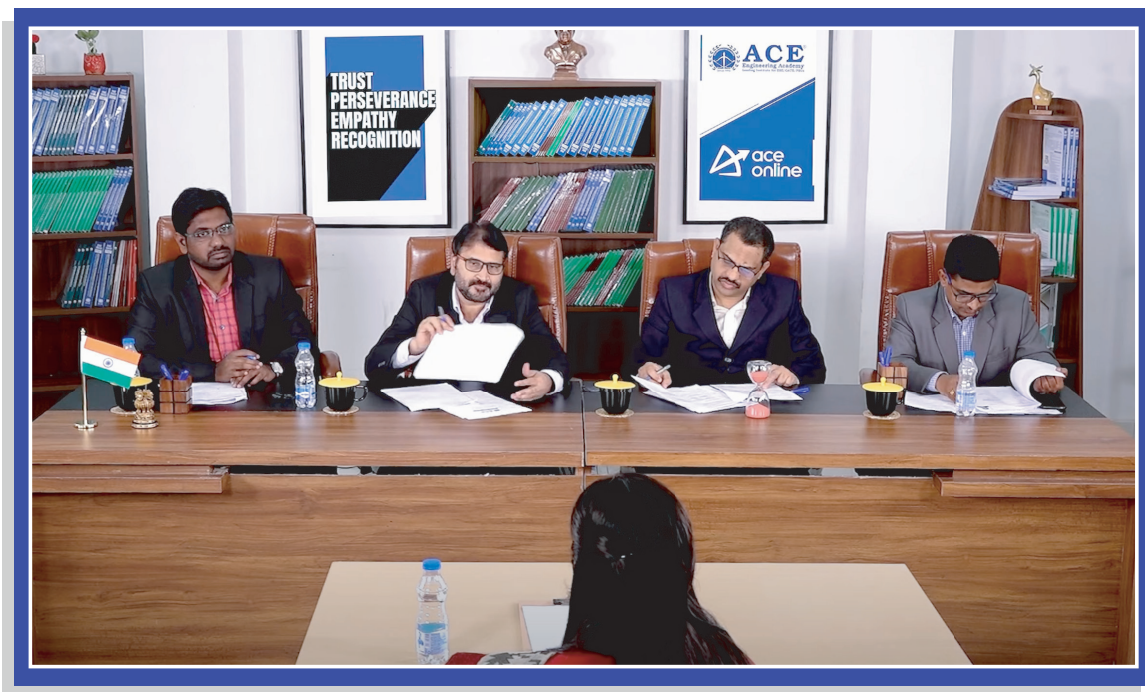
75. A coil consists of 750 turns and a current of 10 A in the coil gives rise to a magnetic flux of $1200 \mu\text{Wb}$. What are the inductance of the coil and the average e.m.f. induced in the coil when this current is reversed in 0.01 second respectively?
- (a) 0.09 H and 180 V (b) 0.09 H and 90 V
(c) 0.18 H and 90 V (d) 0.18 H and 180 V

75. Ans: (a)

INTERVIEW GUIDANCE



- **Interview Guidance Program** aids Job Seekers when there is one more hurdle away to make their name on the Final List.
- Attempting an Interview is a skill that enhances with preparation and practice.
- ACE will teach you how to handle interviews and improve your interview techniques to increase your chances of being successful.
- ACE conducts Mock Interviews with expert panel members both Offline & Online to prepare you whether it is a College Admission Interview or a Job Interview.



Our Social Links



aceonlineprep



aceonlineprep



aceonline



@aceengacademy



aceacademyindia_official



www.ace.online | www.aceenggacademy.com



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 15 ::

76. Vector potential is a vector
 (a) whose curl is equal to the magnetic flux density
 (b) whose curl is equal to the electric field intensity
 (c) whose divergence is equal to the electric potential
 (d) which is equal to the vector product $E \times H$

76. Ans: (a)

77. If the magnetic vector potential $A = -\frac{\rho^2}{4} a_z$ Wb/m, What is the total magnetic flux crossing the surface $\phi = \frac{\pi}{2}$, $1 \leq \rho \leq 2$ m. $0 \leq z \leq 5$ m?
 (a) 3.25 Wb (b) 3.50 Wb
 (c) 3.75 Wb (d) 4.00 Wb

77. Ans: (c)

78. A vector $\vec{P}$ is given by $\vec{P} = x^3 \vec{a}_x - x^2 y^2 \vec{a}_y - x^2 y z \vec{a}_z$. Which one of the following statements is correct?
 (a) $\vec{P}$ is solenoidal, but not irrotational
 (b) $\vec{P}$ is irrotational, but not solenoidal
 (c) $\vec{P}$ is neither solenoidal nor irrotational
 (d) $\vec{P}$ is both solenoidal and irrotational

78. Ans: (c)

79. The electric field on the surface of a perfect conductor is 2 V/m. The conductor is immersed in water with $\epsilon = 80\epsilon_0$. The surface charge density on the conductor is
 (a) 0 C/m² (b) 2 C/m²
 (c) 1.8×10^{-11} C/m² (d) 1.41×10^{-9} C/m²

79. Ans: (d)

80. If the electric field intensity is given by $\vec{E} = (xu_x + yu_y + zu_z)$ V/m, then potential difference between X(2, 0, 0) and Y(1, 2, 3) is

- (a) +1V (b) -1V
 (c) +5V (d) +6V

80. Ans: (c)

81. The radiation pattern of an antenna in spherical coordinates is given by $F(\theta) = \cos^4(\theta)$, $0 \leq \theta \leq \frac{\pi}{2}$. The directivity of the antenna is
 (a) 16.42 (b) 18.02
 (c) 20.42 (d) 22.02

81. Ans: (b)

82. The directive gain $G_d(\theta, \phi)$ depends on antenna pattern. For the Hertzian dipole, P_{avg} is maximum at $\theta = \frac{\pi}{2}$ and minimum at $\theta = 0$ or π . For an isotropic antenna, $G_d(\theta, \phi) = 1$. The directive gain $G_d(\theta, \phi)$ can be defined as
 (a) the measure of the concentration of the radiated power in a particular direction
 (b) the total radiated power divided by 4π
 (c) the ratio of the maximum radiation intensity to the average radiation intensity
 (d) the ratio of total power divided by array factor

82. Ans: (c)

83. Consider a parallel-plate capacitor, each of the plates has an area S and they are separated by a distance d. Assume that plates 1 and 2 carry charges +Q and -Q uniformly distributed on them. The energy stored in the capacitor is
 (a) $-\frac{Q}{\epsilon S} a_x$ (b) $\frac{Qd}{\epsilon S}$
 (c) $\frac{1}{2C} Q^2$ (d) $\frac{1}{2} Q.C$

83. Ans: (c)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad - 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 16 ::

84. Two dipoles with dipole moments $-5a_z$ nC-m and $9a_z$ nC-m are located at points $(0, 0, -2)$ and $(0, 0, 3)$, respectively. What is the potential at the origin?

- (a) -24.25 V (b) -22.25 V
(c) -20.25 V (d) -18.25 V

84. Ans: (c)

85. If $\nabla \cdot \mathbf{D} = \epsilon \nabla \cdot \mathbf{E}$ and $\nabla \cdot \mathbf{J} = \sigma \nabla \cdot \mathbf{E}$ in a given material, the material is said to be

- (a) linear and isotropic
(b) linear and homogeneous
(c) isotropic and homogeneous
(d) homogeneous and dielectric

85. Ans: (b)

86. The frequency range for the broadcast satellite service is

- (a) 2 GHz to 4 GHz (b) 4 GHz to 8 GHz
(c) 8 GHz to 12.5 GHz (d) 12.5 GHz to 26.5 GHz

86. Ans: (d)

87. In an advance mobile phone system (AMPS), which of the following separate channels in a link is/are used?

- (a) TDMA only (b) FDMA only
(c) SDMA only (d) Both TDMA and FDMA

87. Ans: (d)

88. In op-amp, the effect of asymmetries between the internal circuits driven by inputs can be reduced by

- (a) adding resistor at the input to V_{cc}^+ side
(b) driven by an AC voltage source
(c) connecting a Zener diode at the input side
(d) connecting the slider of the potentiometer to V_{cc}^-

88. Ans: (d)

89. By considering standard notations, the line width of the spontaneous emission is approximately

- (a) $\Delta\lambda = 2\lambda_{peak}^{3/2} \cdot kT$ (b) $\Delta\lambda = 1.45\lambda_{peak}^3 \cdot kT$
(c) $\Delta\lambda = 2\lambda_{peak}^{1/4} \cdot kT$ (d) $\Delta\lambda = 1.45\lambda_{peak}^2 \cdot kT$

89. Ans: (d)

90. As per the Wien's displacement law, the spectral distribution of the energy emitted at a given temperature has

- (a) a definite minimum and this minimum shifts to longer wavelengths as the temperature decreases
(b) a definite minimum and this minimum shifts to shorter wavelengths as the temperature increases
(c) a definite maximum and this maximum shifts to shorter wavelengths as the temperature decreases
(d) a definite maximum and this maximum shifts to shorter wavelengths as the temperature increases

90. Ans: (b)

91. The VSWR can have any value between

- (a) 0 and 1 (b) -1 and 1
(c) 1 and ∞ (d) 0 and ∞

91. Ans: (c)

92. Which of the following modes has the solution of $H_z = 0$, but $E_z \neq 0$?

- (a) TEM only (b) TE only
(c) TM only (d) Both TE and TM

92. Ans: (c)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad - 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online

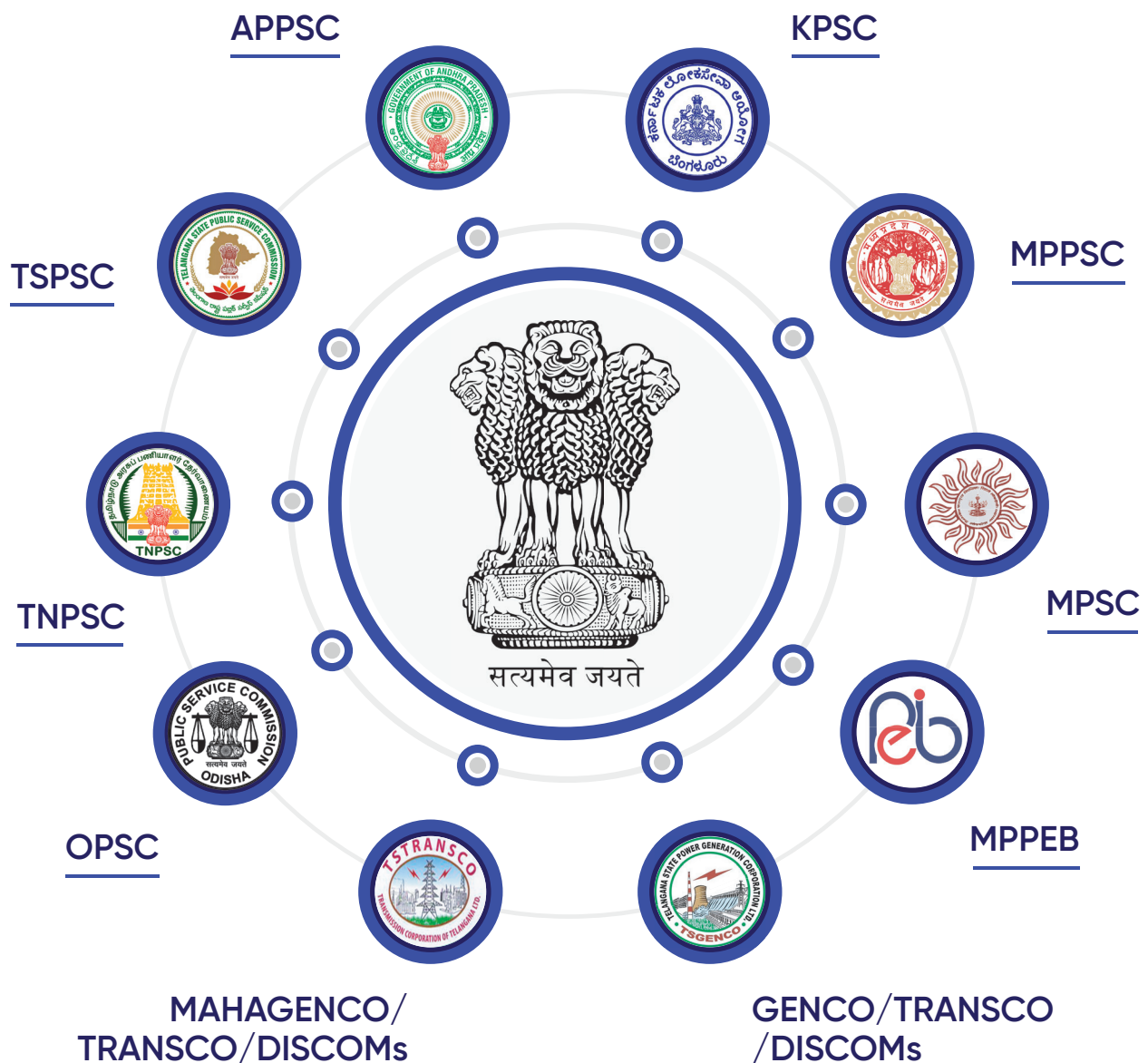


India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

STATE SERVICE COMMISSION

About

State Public Service Commission (PSC) supports the governments of various states with hiring, deploying, and disciplinary actions. State Public Service Commissions hire the majority of Group-A officials for state governments, recruits officers for the Group-B cadre, and hold exams for positions in the Military, Engineering, Medicine, and Civil Services.





ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)



ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 17 ::

93. Consider the following statements regarding impedance matching:

1. The single-stub tuner (matching) consists of an open or shorted section of transmission line of length d connected in parallel with the main line at some distance l from the load.
2. An open-circuited stub radiates some energy at high frequencies.
3. Double-stub matching allows for the adjustment of the load impedance.
4. At very high frequencies, lumped inductances and capacitances can be used as circuit elements.

Which of the above statements are correct?

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

93. Ans: (b)

94. What is a four-line to two-line priority encoder with active HIGH inputs and outputs, with priority assigned to the higher-order data input line?

- (a) $X = D_2 + D_3$ and $Y = D_1 \overline{D_2} + D_3$
(b) $X = D_1 + D_3$ and $Y = D_1 \overline{D_2} + D_3$
(c) $X = D_2 + \overline{D_3}$ and $Y = D_1 \overline{D_2} + \overline{D_3}$
(d) $X = \overline{D_2} + D_3$ and $Y = \overline{D_1} \overline{D_2} + D_3$

94. Ans: (a)

95. How many flip-flops are required to build a binary counter that counts from 0 to 4095?

- (a) $N = 10$ (b) $N = 11$
(c) $N = 12$ (d) $N = 13$

95. Ans: (c)

96. A 2-bit binary multiplier can be implemented using
- (a) two full adders and a two-input AND gate
 - (b) two half adders and four numbers of two-input AND gate
 - (c) one full adder, one half adder and one two-input AND gate
 - (d) one full adder and one two-input AND gate

96. Ans: (b)

97. For a binary half subtractor having two inputs A and B, the correct set of logical expressions for the outputs D (difference) and X (borrow) is

- (a) $D = AB + A\overline{B}$, $X = A\overline{B}$
(b) $D = A\overline{B} + \overline{A}B + A\overline{B}$, $X = A\overline{B}$
(c) $D = \overline{A}B + A\overline{B}$, $X = \overline{A}B$
(d) $D = AB + \overline{A}B$, $X = A\overline{B}$

97. Ans: (c)

98. Which one of the following statements is correct?

- (a) ECL has the least propagation delay.
(b) TTL has the least propagation delay.
(c) CMOS has the highest power dissipation.
(d) TTL has the lowest power consumption.

98. Ans: (a)

99. Each cell of a static random access memory contains

- (a) six MOS transistors
(b) four MOS transistors and two capacitors
(c) two MOS transistors and four capacitors
(d) one MOS transistor and one capacitor

99. Ans: (a)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 18 ::

100. The following sequence of instructions is executed by an 8085 microprocessor :

1000 H LXI SP, 27FF H
1003 H CALL 1006 H
1006 H POP H

The contents of the stack pointer (SP) and the HL register pair on completion of execution of these instructions are

- (a) SP = 27FF H and HL = 1003 H
- (b) SP = 27FD H and HL = 1003 H
- (c) SP = 27FF H and HL = 1006 H
- (d) SP = 27FD H and HL = 1006 H

100. Ans: (c)

101. The total number of memory accesses involved when an 8085 processor executes the instruction LDA 2003 H is

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

101. Ans: (d)

102. The contents of register (B) and accumulator (A) of an 8085 microprocessor are 3C H and 89 H respectively. The contents of A and the status of carry flag (CY) and sign flag (S) after executing SUB B instructions are

- (a) A = C5 H, CY = 1, S = 1
- (b) A = 5C H, CY = 1, S = 1
- (c) A = C5 H, CY = 0, S = 1
- (d) A = 5C H, CY = 0, S = 1

102. Ans: no option matching

103. For an 8085 microprocessor, the following program is executed:

MVI A, 05 H
MVI B, 05 H
PTR: ADD B
DCR B
JNZ PTR
ADI 03 H
HLT

At the end of the program, accumulator contains

- (a) 17 H (b) 20 H (c) 23 H (d) 05 H

103. Ans: (a)

104. Let $x_a(t)$ be an analog signal with bandwidth $B = 6$ kHz. We wish to use an $N = 2^m$ point DFT to compute the spectrum of the signal with resolution less than or equal to 200 Hz. What is the minimum length of the analog signal recorded?

- (a) 60 seconds
- (b) 0.05 second
- (c) 0.005 second
- (d) 6000 seconds

104. Ans: (c)

105. The z-transform of the impulse response of a causal LTI system is $H(Z) = \frac{1}{2} \frac{Z^{-1}}{Z^{-2} - 4.5Z^{-1} + 5}$. What is an input $x(n)$ that would produce the output $y(n) = u(-n) + (0.5)^n u(n)$?

- (a) $x(n) = [0.5^n - 0.4^n]u(n)$
- (b) $x(n) = 10u(n+1) - 14u(n) + 2u(n-1) + 3u(-n)$
- (c) $x(n) = [0.5^n + 0.4^n]u(n)$
- (d) $x(n) = 10u(n+1) - 14u(-n) + 2u(n+1) + 3u(n)$

105. Ans: no option matching

106. Which one of the following is used to perform a transfer between two memory-mapped devices without the intervention of the CPU or the use of main memory?

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad - 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

Staff Selection Commission JE

About

Staff Selection Commission recruits Junior Engineer posts for diverse Ministries, Departments of the Government of India, and for its subordinate offices. It is a National-level exam conducted at the State and Central levels in Hindi and English Languages.



CUT-OFF MARKS

CE - PAPER-1

Category	2020	2019	2018	2017	2016
UR	120.02	123.52	127.4	136.25	100
OBC	114.21	115.93	122.91	133.25	92.5
EWS	108.14	112.28	118.99	–	–
SC	99.15	101.70	107.61	120	84.5
ST	99.15	102.61	107.01	114.5	85.5
OH	79.83	92.24	–	113	72.5
HH	48.86	55.73	–	83.5	40

ME | EE - PAPER 1

Category	2020	2019	2018	2017	2016
UR	141.59	157.47	152.16	117c	115
OBC	137.46	153.26	149.3	110.75	109.5
EWS	131.23	151.04	147.47	–	–
SC	123.23	140.59	133.39	101.75	99
ST	115.34	135.88	125.49	105	94.5
OH	99.43	127.29	–	91.5	87
HH	63.07	92.49	–	61.75	54





ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 19 ::

- (a) Direct virtual memory access
- (b) Cycle stealing
- (c) Direct memory access
- (d) Programmed I/O

106. Ans: (c)

107. Consider the division of a dividend $X = 0100000$ and a divisor $D = 0110$. Then the quotient (Q) and the remainder (R) respectively are

- (a) 0101 and 0010
- (b) 0110 and 0011
- (c) 1010 and 1011
- (d) 1100 and 0010

107. Ans: (a)

108. Which one of the following threats is used to facilitate the designer of a program or system which might leave a hole in the software that only he/she is capable of using?

- (a) Spyware
- (b) Trap Door
- (c) Trojan Horse
- (d) Logic Bomb

108. Ans: (b)

109. Windows keeps much of its configuration information in internal databases called

- (a) system restore point
- (b) service trigger
- (c) service control manager
- (d) hives

109. Ans: (d)

110. Which one of the following is a drawback of programmed and Interrupt-Driven I/O?

- (a) The processor is tied up in managing an I/O transfer, a number of instructions must be executed for each I/O transfer

- (b) A more efficient technique is to use a daisy chain, which provides, in effect, a hardware poll
- (c) When the processor detects an interrupt, it branches to an interrupt service routine whose job is to poll each I/O module
- (d) A more efficient technique is not to use a daisy chain, which provides, in effect, a hardware poll

110. Ans: (a)

111. Which one of the following methods requires saving the value of the CPU registers from the thread being switched out and restoring the new thread being scheduled?

- (a) Context switching between kernel level threads
- (b) Scheduling switching
- (c) Kernel dispatcher
- (d) Multilevel queue scheduling

111. Ans: (a)

112. A parallel-plate air-filled capacitor has plate area of 10^{-4} m^2 and plate separation of 10^{-3} m . It is connected to a 0.5 V, 4.5 GHz source. The magnitude of the displacement current is (take

$$\epsilon_0 = \frac{1}{36\pi \times 10^9} \text{ F/m}$$

- (a) 10 mA
- (b) 10 A
- (c) 12.5 mA
- (d) 50 A

112. Ans: (c)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)



ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 20 ::

113. A coaxial cable with an inner diameter of 1 mm and outer diameter of 2.4 mm is filled with a dielectric of relative permittivity 10.89. Given $\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$, $\epsilon_0 = \frac{1}{36\pi \times 10^9} \text{ F/m}$. The characteristic impedance of the cable is

- (a) 33 Ω (b) 43.4 Ω
(c) 143.3 Ω (d) 16 Ω

113. Ans: (d)

114. The electric field of a uniform plane electromagnetic wave in free space, along the positive x direction, is given by $\vec{E} = 10(a_y + ja_z)e^{-j25x}$. The frequency and polarization of the wave respectively are

- (a) 1.2 GHz and right circular
(b) 1.2 GHz and left circular
(c) 4 GHz and right circular
(d) 4 GHz and left circular

114. Ans: (b)

115. In electromagnetic field, which one of the following does **not** satisfy the wave equation?

- (a) $25e^{i(\omega t - 3z)}$ (b) $\sin(\omega(27z + 15t))$
(c) $\sin(x) \cos(t)$ (d) $\cos(y^2 + 5t)$

115. Ans: (d)

116. The intrinsic impedance of copper at high frequency is

- (a) purely resistive
(b) purely inductive
(c) complex with an inductive component
(d) complex with a capacitive component

116. Ans: (c)

117. The depth of penetration of a wave in a lossy dielectric increases with increasing

- (a) conductivity (b) permeability
(c) wavelength (d) permittivity

117. Ans: (c)

118. Which one of the following can wave propagate in a conducting medium before its amplitude becomes insignificant?

- (a) Characteristic impedance (b) Skip distance
(c) Line of sight (d) Skin depth

118. Ans: (d)

119. Copper behaves as a

- (a) conductor always
(b) conductor or dielectric depending on the applied electric field strength
(c) conductor or dielectric depending on the frequency
(d) conductor or dielectric depending on the dielectric current density

119. Ans: (a)

120. A transmission line has a characteristic impedance of 50 Ω and a resistance of 0.1 Ω/m . If the line is distortionless, the attenuation constant is

- (a) 500 (b) 5
(c) 0.01 (d) 0.002

120. Ans: (d)

121. A second-order system has a closed-loop transfer function given by $G(s) = \frac{25}{s^2 + 8s + 25}$. The settling time for 5 percentage band in tolerance error is

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad - 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online

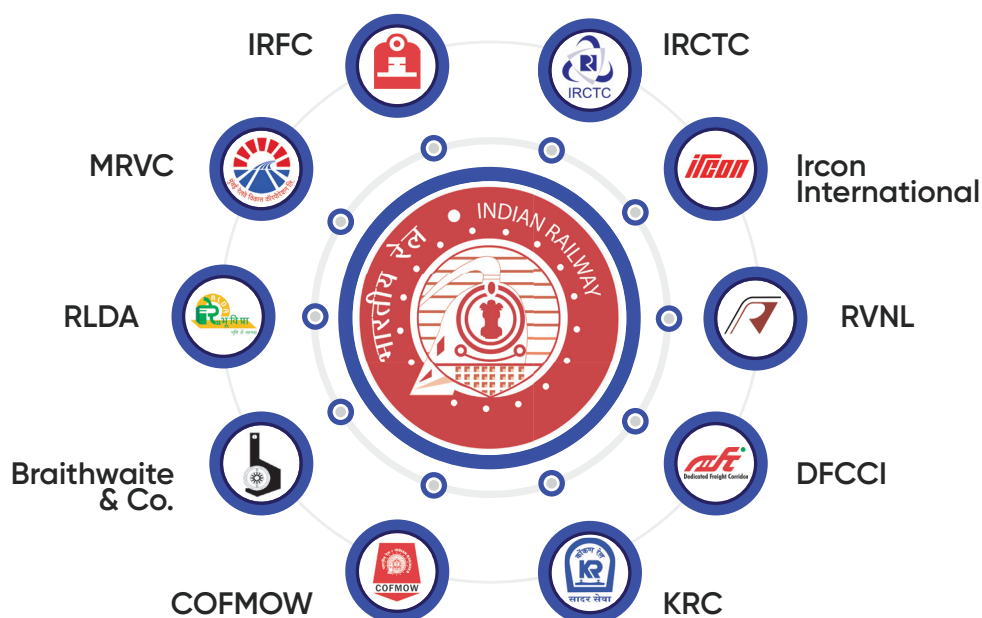


India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

Railway Recruitment Board JE

About

Railway Recruitment Board is a government organization in India that was set up in 1998 by the Ministry of Railways. Every year RRB organizes the recruitment for 21 boards situated in Different parts of India to work in Indian railways. It is primarily responsible for recruiting group 'C' staff across the nation.



CUT-OFF MARKS

RRB JE CBT - 1

Category	Ahmedabad	Allahbad	Mumbai
Gen	53.25	74.67	65.4
SC	35.06	59.89	52.55
ST	41.59	51.48	44.025
OBC	39.86	62.61	54.01
-	-	-	-

RRB JE CBT - 2

Category	Min. Qualifying Perc	Min. Qualifying Marks (Out of 150)
Gen	40%	60
EWS	40%	60
SC	30%	45
ST	25%	37.5
OBC	30%	45





ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)

ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 21 ::

- (a) $\frac{1}{3}$ sec (b) $\frac{3}{4}$ sec
(c) 2 sec (d) 4 sec

121. Ans: (b)

122. The output of a standard second-order system for a unit-step input is given as $y(t) = 1 - \frac{2}{\sqrt{3}}e^{-t}\cos\left(\sqrt{3}t - \frac{\pi}{6}\right)$. What is the transfer function of the system?

- (a) $\frac{2}{(s+2)(s+\sqrt{3})}$ (b) $\frac{1}{s^2+2s+1}$
(c) $\frac{3}{s^2+2s+3}$ (d) $\frac{4}{s^2+2s+4}$

122. Ans: (d)

123. Consider a causal second-order system with the transfer function $G(s) = \frac{1}{s^2+2s+1}$ with a unit-step $R(s) = \frac{1}{s}$ as an input. Let $c(s)$ be the corresponding output. The time taken by the system output $c(t)$ to reach 94% of its steady-state value $\lim_{t \rightarrow \infty} c(t)$, rounded off to two decimal places, is

- (a) 5.25 (b) 2.81
(c) 4.50 (d) 3.89

123. Ans: (c)

124. Non-minimum phase transfer function defined as the transfer function

- (a) which has zeros in the right-half s-plane
(b) which has poles in the left-half s-plane
(c) which has poles in the negative right-half s-plane
(d) which has zeros only in the left-half s-plane

124. Ans: (a)

125. A system has poles at 0.01 Hz, 1 Hz and 80 Hz; zeros at 5 Hz, 100 Hz and 200 Hz. The approximate phase of the system response at 20 Hz is

- (a) -90° (b) 0°
(c) 90° (d) -180°

125. Ans: (a)

126. The magnitude of frequency response of an underdamped second-order system is 5 at 0 rad/sec and peaks at $\frac{10}{\sqrt{3}}$ is $5\sqrt{2}$ rad/sec. The transfer function of the system is

- (a) $\frac{100}{s^2+10s+100}$ (b) $\frac{375}{s^2+5s+75}$
(c) $\frac{500}{s^2+12s+100}$ (d) $\frac{1125}{s^2+25s+225}$

126. Ans: (c)

127. By considering standard notations, the peak value of the magnitude in the resonant peak M_r is

- (a) $\frac{2}{\zeta\sqrt{1-\zeta^2}}$ (b) $\frac{1}{\zeta\sqrt{2-\zeta^2}}$
(c) $\frac{1}{2\zeta\sqrt{1-\zeta^2}}$ (d) $\frac{1}{\zeta\sqrt{1-\zeta^2}}$

127. Ans: (c)

128. The phase margin of a system having the loop transfer function $G(s)H(s) = \frac{2\sqrt{3}}{s(s+1)}$ is

- (a) 45° (b) 90° (c) 30° (d) 60°

128. Ans: (c)

129. The phase margin of a system with the open-loop transfer function $G(s)H(s) = \frac{1-s}{(s+1)(s+2)}$ is

- (a) 0° (b) 63.4° (c) 90° (d) ∞°

129. Ans: (d)

HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

POSTAL COACHING



- **Postal Coaching** is offering the study material delivered to your doorstep in a printed format enabling you to prepare for your exams through self-learning.
- These subject materials consist of basic level to higher notes to focus on strong concept building prepared by a qualified and dedicated R & D team.

ACE PUBLICATIONS



www.aceengineeringpublications.com

[amazon](#)

[Flipkart](#)

+91-7799996602

www.ace.online | www.aceenggacademy.com



130. What is the overall number of Clock cycles Per Instruction (CPI) for a machine A for which the following performance measures were recorded when executing a set of benchmark programs? (Assume the clock rate of the CPU as 200 MHz and execution of 100 instructions)

Instruction Category	Percentage of occurrence	No. of cycles per instruction
ALU	38	1
Load and store	15	3
Branch	42	4
Others	5	5

- (a) 2.76 (b) 4.76
(c) 6.76 (d) 8.76

130. Ans: (a)

131. What is the number of bits in the main memory address for a memory system having the following specification?

Size of the main memory is 4K blocks, size of the cache is 128 blocks and the block size is 16 words (Assume that the system uses set-associative mapping with four blocks per set)

- (a) 18 (b) 20
(c) 24 (d) 16

131. Ans: (d)

132. Consider the following reference string of pages made by a processor :

4, 7, 5, 7, 6, 7, 10, 4, 8, 5, 8, 6, 8,
11, 4, 9, 5, 9, 6, 9, 12, 4, 7, 5, 7

Assume that the number of page frames allocated in the main memory is four. What is the number of page faults generated using Least Recently Used

(LRU) replacement technique?

- (a) 15 (c) 18
(b) 17 (d) 16

132. Ans: (c)

133. Which one of the following is correct with respect to short-term scheduling?

- (a) The decision as to which available process will be executed by the processor
(b) The decision as to which process's pending I/O request shall be handled by an available I/O device
(c) The decision to add to the pool of processes to be executed
(d) The decision to add to the number of processes that are partially or fully in main memory

133. Ans: (a)

134. Which one of the following statements is correct with respect to bounded buffer in shared memory systems?

- (a) The consumer may have to wait for new items, but the producer can always produce new items.
(b) The consumer must wait if the buffer is empty, and the producer must wait if the buffer is full.
(c) The producer and consumer must be synchronized, so that the consumer does not try to consume an item.
(d) Shared memory suffers from cache coherency issues, which arise because shared data migrate among the several caches.

134. Ans: (b)

135. Which one of the following is relevant to non-preemptive kernels?
- (a) Kernel allows a process to be preempted while it is running in kernel mode.
 - (b) Kernel data structure maintains a list of all open files in the system.
 - (c) Kernel does not allow a process running in kernel mode to be preempted; a kernel-mode process will run until it exits kernel mode, blocks, yields control of the CPU.
 - (d) Prone to possible race conditions include structures for maintaining memory allocation, for maintaining process lists and for interrupt handling.

135. Ans: (c)

136. The power transmitted by an SSB transmitter is 20 kW. It is required to be replaced by standard AM transmission having modulation index of 0.4 and same power. What is the transmission efficiency?
- (a) 3.7% (b) 5.8%
(c) 7.4% (d) 21.6%

136. Ans: (c)

137. An angle modulated signal is given as

$$x_c(t) = 20 \cos\left[200\pi t + \frac{\pi}{4}\right].$$

What is the instantaneous frequency?

- (a) 50 Hz (b) 100 Hz
(c) 200 Hz (d) 400 Hz

137. Ans: (b)

138. An FM modulator operates at carrier frequency of 250 kHz with frequency deviation sensitivity of 1.5 kHz/V. A PM modulator operates at carrier frequency of 500 kHz with phase deviation sensitivity of 1.5 rad/V. If both FM and PM modulators are modulated by the same modulating signal having peak amplitude of 5V and modulating frequency of 5 kHz, then what is the relationship between frequency modulation index and phase modulation index?
- (a) $PM = FM$ (b) $PM = 2FM$
(c) $PM = 4FM$ (d) $PM = 5FM$

138. Ans: (d)

139. What is the relationship between the percentage efficiency saving when the carrier wave and one of the sidebands are suppressed in an AM wave modulated to a depth of 100% modulation index?
- (a) $\eta_{\text{DSB}} = 2.5\eta_{\text{AM}}$ (b) $\eta_{\text{DSB}} = 4\eta_{\text{AM}}$
(c) $\eta_{\text{DSB}} = 5\eta_{\text{AM}}$ (d) $\eta_{\text{DSB}} = 2\eta_{\text{AM}}$

139. Ans: (a)

140. An audio signal $s(t) = 5\cos(2000\pi t)$ is quantized using 10-bit PCM. What is the signal-to-quantization noise ratio?
- (a) 3.57×10^6 (b) 2.57×10^6
(c) 1.57×10^6 (d) 0.57×10^6

140. Ans: (c)

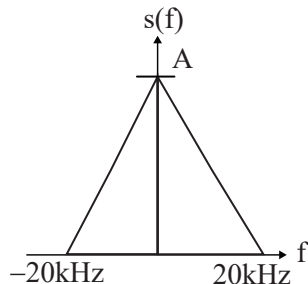
141. An FM audio signal with single-tone modulation has a frequency deviation of 25 kHz and a bandwidth of 75 kHz. What is the frequency of the modulating signal using Carson's rule?



- (a) 12.5 kHz (b) 25 kHz
(c) 50 kHz (d) 75 kHz

141. Ans: (a)

142. An audio signal $s(t)$ is normalized, whose Fourier transform $S(f)$ is shown in the figure, so that $|s(t)| \leq 1$. This signal is to be transmitted using FM with a frequency deviation constant $k_f = 90$ kHz/V. What is the bandwidth required for transmission of the FM audio signal?



- (a) 140 kHz (b) 180 kHz
(c) 220 kHz (d) 260 kHz

142. Ans: (c)

143. A collector modulated class-C power amplifier is giving an amplitude modulated signal of 220 W average power at the output, while operating with a collector circuit efficiency of 40%. What is the power to be supplied by the modulating amplifier when the modulation index is 0.4?

- (a) 16.3 W (b) 40.75 W
(c) 203.7 W (d) 220 W

143. Ans: (b)

144. By considering standard notations, the normalized power of the AM signal is

(a) $s^2(t) = \frac{1}{2} A_c^2 + \frac{1}{2} A_c^2 [m^2(t)]$

(b) $s^2(t) = A_c^2 + \frac{1}{2} A_c^2 [m^2(t)]$

(c) $s^2(t) = \frac{1}{2} A_c^2 + A_c^2 [m^2(t)]$

(d) $s^2(t) = \frac{1}{4} A_c^2 + \frac{1}{4} A_c^2 [m^2(t)]$

144. Ans: (a)

145. A certain AM transmitter is radiating 125 kW when a certain audio sine wave is modulating it to a depth of 70% and 144.5 kW when a second sinusoidal audio wave also modulates it simultaneously. What is the depth of the modulation for the second audio wave?

(a) $\sqrt{0.4}$ (b) $\sqrt{0.3}$

(c) $\sqrt{0.2}$ (d) $\sqrt{0.1}$

145. Ans: (a)

146. An audio signal comprising of a single sinusoidal term $s(t) = 3\cos(2\pi 1000t)$ is quantized using DM. What is the signal-to-quantization noise ratio?

(a) 120 (b) 170

(c) 107 (d) 100

146. Ans: no option matching

147. The number of quantization levels is increased from 4 to 64. The bandwidth required for the transmission of a PCM signal increases by a factor of

(a) $1/3$ (b) $1/4$

(c) $1/5$ (d) $1/6$

147. Ans: (*)



ACE[®]
Engineering Academy
(Leading Institute for ESE/GATE/PSUs)



ace
online

ESE - 2023

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Questions with Detailed Solutions

:: 25 ::

148. By considering standard notations, the transfer function of a tachometer is of the form

- (a) $K_t s$ (b) $\frac{K_t}{s}$
(c) $\frac{K_t}{s+1}$ (d) $\frac{K_t}{s(s+1)}$

148. Ans: (a)

149. The open-loop DC gain of a unity negative feedback system with closed-loop transfer function $\frac{s+4}{s^2+7s+13}$ is

- (a) $\frac{4}{13}$ (b) $\frac{2}{3}$
(c) $\frac{1}{3}$ (d) $\frac{4}{9}$

149. Ans: (d)

150. A second-order system has a transfer function given by $G(s) = \frac{25}{s^2 + 8s + 25}$. If the system, initially at rest, is subjected to a unit-step input at $t = 0$, the second peak in the response will occur at

- (a) $\frac{\pi}{3}$ sec (b) $\frac{2\pi}{3}$ sec
(c) $\frac{\pi}{2}$ sec (d) π sec

150. Ans: (d)

For Video Solutions click below link (or) Scan QR

<https://www.youtube.com/watch?v=iDnDefdKlrQ>



HEAD OFFICE: #3rd Floor, Suryalok Complx, Rosary Convent School Road, Gunfoundary, Hyderabad – 01, Telangana, India.

Call: +91 779999 6602 | www.aceenggacademy.com | www.ace.online | help@ace.online



India's Best Online Coaching Platform for GATE, ESE, PSUs, SSC-JE, RRB-JE, Banks, Groups & PSC Exams

GATE - 2022 TOP RANKERS

AIR 1  Gaurav Kumar EE	AIR 1  Nikhil Kumar S ME	AIR 1  Sourabh Patel PI	AIR 1  Saurabh Singh ES	AIR 1  Prabhav NM	AIR 2  Vivek Dhamale ME
AIR 2  Vandit Patel EE	AIR 2  Shanu Singh XE	AIR 2  Amit Kumar Rai CE	AIR 2  Brijesh Aggarwal ES	AIR 3  Shivam Singh EC	AIR 3  Parvinder Singh ME
AIR 3  Saurabh Singh CE	AIR 3  KMV Nagesh PI	AIR 4  Gaurav Kumar CE	AIR 4  Niladri Dutta EE	AIR 4  Pritam Kumar ME	AIR 4  Vishesh Kumar PI
AIR 4  Siddarth XE	AIR 5  Pankaj Siyag ME	AIR 5  Sooryadas S PI	AIR 5  Niladri Dutta IN		

and many more...

ESE - 2022 TOP RANKERS

AIR 1  ISHAN GAUTAM CE	AIR 1  RAJEEV DAIPURIYA E&T	AIR 1  AKHIL KUMAWAT EE	AIR 1  ABHISHEK TIWARI ME		
AIR 2  ABHISHEK YADAV CE	AIR 2  N LAKSHMI VENKATESH E&T	AIR 2  KUNAL SAURAV EE	AIR 2  RAVI AGRAWAL ME	AIR 3  SWASTIK SHARMA CE	AIR 3  D TEJASWINI E&T
AIR 3  LOKESH AGRAWAL EE	AIR 3  BAMMAR JABARABHAI ME	AIR 4  KUNAL DAHIYA CE	AIR 4  AYUSH KR TIWARI E&T	AIR 4  PRABHAKAR VERMA EE	
AIR 4  ATUL KUMAR PATEL ME	AIR 5  D PAVAN REDDY CE	AIR 5  V. VIVEK GUPTA E&T	AIR 5  PRANSHU SRIVASTAVA ME		

and many more...