TSPSC - 2022

Assistant Executive Engineer Examination (AEE)

Questions With Detailed Solutions

ELECTRICAL ENGINEERING

All Queries related to **TSPSC-AEE 2022** Solutions are to be sent to the following email address **help@ace.online**

Call: **+91 779999 6602**

www.ace.online
www.aceenggacademy.com

SUBJECTWISE WEIGHTAGE

S.No.	Name of the Subject	No. of Questions
1	EMT	9
2	Electric Circuits	16
3	Control Systems	11
4	Electrical Machines	35
5	Power Systems	15
6	Electrical & Electronic Measurements	6
7	Power Electronics	21
8	Signal Systems	5
9	Analog Electronics	16
10	Digital Electronics	8
11	UEE	8
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

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

01. Consider an infinite uniform line charge of 5 nC/m along the x axis in free space. Calculate the electric field at a distance of 2m from the line charge along the z axis.

    (a) 45 $\hat{z}$ V/m   (b) 90 $\hat{z}$ V/m

    (c) 22.5 $\hat{z}$ V/m   (b) 11.25 $\hat{z}$ V/m

01. Ans: (a)

02. A three-phase diode bridge rectifier supplied from a three-phase, 400V, 50Hz ac supply delivers power to a resistive load of 50Ω. The peak value of the instantaneous load voltage would be

    (a) $400\sqrt{(2/3)}$ (b) $400/\sqrt{3}$

    (c) $400\sqrt{2}$ V   (d) 400V

02. Ans: (c)

03. In a single-phase transformer supplied from a constant input voltage, the magnitude of the load current is kept constant while the power factor is varied. Under this condition

    (a) the maximum efficiency occurs at unity power factor

    (b) the power factor where maximum efficiency occurs depends on the leakage inductance values

    (c) the maximum efficiency occurs at power factor of 0.5(lead)

    (d) the maximum efficiency occurs at power factor of 0.5 (lag)

03. Ans: (a)

04. A synchronous generator rated 11kV, 50MVA has a per unit impedance of 0.2pu on its own base. Then its impedance referred to a 22kV, 150MVA base would be

    (a) 0.15pu   (b) 0.133pu

    (c) 0.2pu   (d) 0.1pu

04. Ans: (a)

05. Consider the following statements about a linear system that has a transfer function given as $G(s) = \dfrac{1-s}{1+s}$:

    A. G(s) is a minimum-phase system

    B. The system is BIBO stable

    C. It is an all pass system

    Which of the above statements is/are true?

    (a) A, B and C

    (b) B only

    (c) A and B only

    (d) B and C only

05. Ans: (d)

06. The dynamics of a system is defined by the relation $\ddot{x} + 6\dot{x} + 5x = 10(1 - e^{-t})$. What will be the steady state value of the system output x(t)?

    (a) 3/2   (b) 5/3

    (c) 1   (d) 2

06. Ans: (d)

07. Two synchronous generators G1 and G2 rated 200MW and 400MW respectively are operated in parallel to supply a total load of 300MW. If the governors in both the machines are set to a droop of 4%, what would be the individual power supplied by each generator?

    (a) G1 = 100 MW, G2 = 200MW

    (b) G1 = 50 MW, G2 = 250MW

ace online

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 I GATE I PSUs I 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
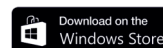- EMI Option Available
- Learning With 2d & 3d Animations

START YOUR 7-DAY FREE TRIAL TODAY!

USE CODE **ENGG10** Get **10% OFF** On All Courses

(c) G1 = 200 MW, G2 = 100MW

(d) G1 = 150 MW, G2 = 150MW

07. Ans: (a)

08. Which of the following machines is most suitable for installation as a generator in a coal-fired thermal power plant?

(a) Squirrel cage induction generator

(b) Wound rotor induction generator

(c) Salient pole synchronous generator

(d) Cylindrical rotor synchronous generator

08. Ans: (d)

09. Which of the following relays used for transmission line distance protection has the property of being inherently directional?

(a) Impedance relay

(b) Reactance relay

(c) MHO relay

(d) OHM relay

09. Ans: (c)

10. A buchholz relay is commonly used for the protection of which of the following?

(a) Busbars

(b) Generators

(c) Transformers

(d) Transmission lines

10. Ans: (c)

11. Which of the following is the purpose of using harmonic restraint function in power transformers?

(a) to prevent false tripping due to magnetising inrush current

(b) to reduce the harmonic power loss in the transformer

(c) to reduce the harmonic content in the transformer voltage

(d) to reduce the harmonic content in transformer current

11. Ans: (a)

12. In an alternator, field current of 20A results in an armature current of 400A when the terminals are short-circuited. The same field current also creates a terminal voltage of 2000V in open circuit. What would be the magnitude of the internal voltage drop within the machine at a load current of 200A?

(a) 100V

(b) 1000V

(c) 1V

(d) 10V

12. Ans: (b)

13. DC voltage of 54.6V is applied across an electric bulb which draws 3.76 A current. What is the power consumed by the bulb?
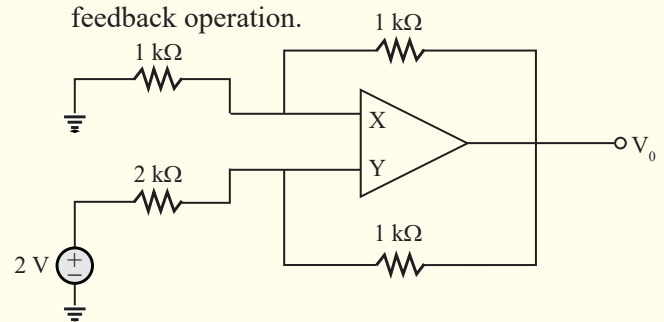
(a) 771.91W

(b) 502.296W

(c) 205.296W

(d) 792.86W

13. Ans: (c)

14. In the circuit below, find the V_o for negative feedback operation.

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

(a) 3V   (b) –4V

(c) 1V   (d) 2V

14. Ans: (b)

15. A average-reading multimeter reads 5V when fed with a square wave symmetric about the time-axis. For the same input an rms-reading meter will read

(a) 5V   (b) 10V

(c) $5/\sqrt{2}$V   (d) $5/\sqrt{3}$V

15. Ans: (a)

16. Find V_{out} in the below circuit. Assume opamp to be ideal.
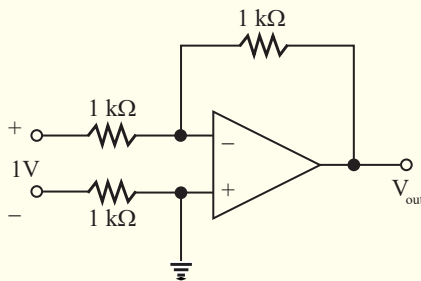
(a) –1V   (b) –2V

(c) 0V   (d) 1V

16. Ans: (a)

17. An ammeter has a range of 0 – 10A with an internal resistance of 0.1Ω. In order to increase its range to 0 – 30A, we need to add a resistance of

(a) 0.05Ω in shunt with the meter

(b) 0.1Ω in shunt with the meter

(c) 0.05Ω in series with the meter

(d) 0.1Ω in series with the meter

17. Ans: (a)

18. A MOSFET biased in common-drain configuration is best suited for designing a

(a) transresistance amplifier

(b) transconductance amplifier

(c) current buffer

(d) voltage buffer

18. Ans: (d)

19. What is the condition to achieve regenerative braking of induction motor?

(a) synchronous speed should be doubled

(b) synchronous speed should be increased by a factor of 1.5

(c) synchronous speed should be a little higher than the rotor speed

(d) synchronous speed should be a little lower than the rotor speed

19. Ans: (d)

20. What is the low order ripple frequency of the output voltage of a three phase fully controlled bridge converter, if the AC input supply frequency is f ?

(a) 3f   (b) 6f

(c) f   (d) 2f

20. Ans: (b)

21. Which of the following armature voltage control method is employed when the supply is dc?

(a) Chopper control

(b) Static Ward - Leonard schemes

(c) Ward-Leonard schemes

(d) Transformers with taps and an uncontrolled rectifier bridge

21. Ans: (a)

22. What is the unit of illumination?
    (a) coulomb (b) lux
    (c) decibel (d) henry

22. Ans: (b)

23. Which bridge is used to measure frequency?
    (a) Wien's bridge (b) Anderson bridge
   (c) Maxwell's bridge (d) Schering bridge

23. Ans: (a)

24. A constant V/f controlled induction motor is fed from a variable voltage variable frequency three phase voltage source inverter. The motor is operated within the base speed. Which of the following is true in torque-speed characteristics of this motor?
    (a) starting torque increases with decrease in frequency and maximum torque decreases
    (b) starting torque decreases with decrease in frequency and maximum torque decreases
    (c) starting torque increases with decrease in frequency and maximum torque remains unchanged
    (d) starting torque decreases with decrease in frequency and maximum torque remains unchanged.

24. Ans: (c)

25. Q1 and Q2 are perfectly matched BJTs. Assuming beta to be infinite and forward bias voltage drop in diode to be 0.7V, find the current I_{out}.
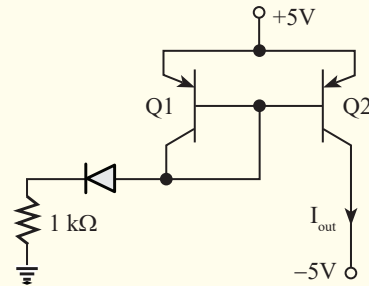
(a) 4.3mA (b) 5.7mA
(c) 0mA (d) 3.6mA

25. Ans: (d)

26. Two channels of CRO are fed with two signals. In the X-Y mode, an ellipse with major axis aligned along the Y axis is observed. The following inference can be made from this
    (a) Two signals are periodic with same amplitude but different frequency
    (b) Two signals are periodic with same frequency but different phase and amplitude
    (c) Two signals are periodic with same frequency and amplitude but different phase
    (d) Two signals are periodic with same frequency and phase but different amplitude

26. Ans: (c)

27. A single-phase diode bridge rectifier is used to supply a highly inductive load. If the load current is assumed to be ripple free, then the input current at the ac side of the rectifier will be
    (a) Triangular wave (b) Square wave
    (c) Purely sinusoidal (d) Pure DC

27. Ans: (b)

ace online | ACE® Engineering Academy — Leading Institute for ESE/GATE/PSUs — Since 1995

GATE 2023 REVISION SERIES
TO GATE 2023 ASPIRANTS

📅 16th Jan – 31st Jan, 2023

Actual Price Rs. 2000 / Avail. at Just Rs. 100

Use Code GATE23

Know your ability to attempt the Exam in Real Time With
ACE Pre-GATE 2023 Exam

📅 26TH JANUARY'2023
9:30AM TO 12:30PM

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

Register Now
*Registration fee – ₹100/-

Draw the sense of real exam with
ACE Pre-ESE 2023

🕐 Paper I – 10:00AM to 12:00 PM
Paper II – 2:00PM to 5:00PM

EC | EE | ME | CE

📅 13TH FEBRUARY'2023

Exam Centers
Hyderabad , Delhi , Pune , Vizag

Register Now
*Registration Fee – ₹100/-

Scan QR Code for **Registrations**

www.ace.online

28. A three-phase 33kV, oil-circuit breaker is rated 1500A, 2000MVA, 2s. The symmetrical breaking current for this breaker would be
    (a) 50kA
    (b) 40kA
    (c) 25kA
    (d) 35kA
28. Ans: (d)

29. Consider the following lists regarding compensation techniques in power systems:
    A. Reduce the Ferranti effect
    B. Improve power factor
    C. Increase power flow capability of line
    D. Reduce current ripple

    1. Series capacitor
    2. Shunt reactor
    3. Shunt capacitor
    4. Series reactor
    Choose the option in which all items are correctly matched.
    (a) A–4, B–2, C–1, D–3
    (b) A–2, B–3, C–1, D–4
    (c) A–2, B–1, C–3, D–4
    (d) A–1, B–3, C–2, D–4
29. Ans: (b)

30. The surge impedance of a 300 km long overhead line is 180 ohms. For a 150 km length of the same line, the surge impedance in ohms would be
    (a) 90 Ohms
    (b) 270 Ohms
    (c) 180 Ohms
    (d) 360 Ohms
30. Ans: (c)

31. The transfer function given as $G(s) = \dfrac{s + \alpha}{s + \beta}$ could represent that of a lead compensator, if
    (a) $\alpha = -3$, $\beta = -1$
    (b) $\alpha = 3$, $\beta = 1$
    (c) $\alpha = 1$, $\beta = 2$
    (d) $\alpha = 3$, $\beta = 2$
31. Ans: (c)

32. A unity feedback closed loop system has an output given as $y(t) = e^{-2t} u(t)$ when the input to the system is a unit impulse. Which of the following denotes the transfer function of the open loop system?
    (a) $1/(s + 1)$
    (b) $s/(s + 1)$
    (c) $1/(s + 3)$
    (d) $1/(s + 2)$
32. Ans: (a)

33. Consider the following statements made about short-pitched windings in ac rotating machines:
    A. short-pitching the windings results in reduced fundamental emf compared to full-pitched windings
    B. short-pitching increases the harmonic voltage content in the induced emf.
    C. short-pitched coils have smaller length for the overhang portion
    Which of the above statements is/are true?
    (a) A only
    (b) C only
    (c) A and C only
    (d) A and B only
33. Ans: (c)

34. The speed of an induction motor is increases by increasing the frequency by 20%. If the magnetising current of the machine is to remain constant, then

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

(a) supply voltage must be increaesed by 10%

(b) slip must be increased by 20%

(c) supply voltage must be increased by 20%

(d) supply voltage must be decreased by 20%

34. **Ans: (c)**

35. Which of the following is the reason behind the inability of an ideal synchronous motor to develop any starting torque?

   (a) the rotor winding has a very high reactance

   (b) the stator winding are concentrated windings

   (c) the rotor is extremely heavy in these machines

   (d) the relative velocity between stator and rotor mmf is large at starting

35. **Ans: (d)**

36. Consider the following statements about three-phase voltage source inverters:

   A. they require voltage-bidirectional two quadrant devices to realise the switches

   B. PWM techniques are used to reduce the frequency of the harmonics in the output

   C. in the 180° conduction mode, a new switch is gated in every 60° duration.

   Which of the above statements is/are true?

   (a) A only

   (b) C only

   (c) A and B only

   (d) B and C only

36. **Ans: (d)**

37. Which among the following is an example for a voltage bidirectional two-quadrant switch?

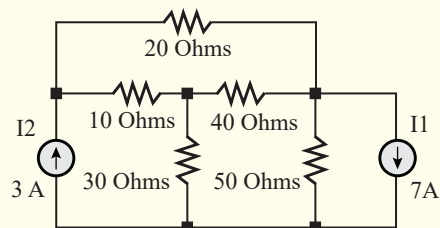(a) MOSFET   (b) SCR

(c) BJT   (d) Diode

37. **Ans: (b)**

38. What should be the value of the capacitance so that the resonance frequency of the circuit below is 314.16 rad/sec?
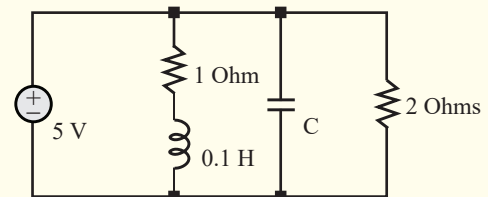
(a) C = 0.1 mF   (b) C = 0.01 mF

(c) C = 1 mF   (d) C = 10mF

38. **Ans: (a)**

39. Consider a circuit below. The voltage across the 3A current source is

(a) 26.17V   (b) 2.617V

(c) 52.35V   (d) 5.235V

39. **Ans: (c)**

40. Laplace transform of f(t) is $\dfrac{s}{s^2 - 4}$. Then the f(t) is

(a) f(t) = cos(2t)   (b) f(t) = sin(2t)

(c) f(t) = cosh(2t)   (d) f(t) = sinh(2t)

40. **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

EXCLUSIVE LIVE CLASSES

ESE + GATE + PSUs – 2024

Regular Batches

23rd Jan 2023	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)

1st Feb 2023	25th Feb 2023	11th Mar 2023
1st April 2023		

IRMSE-2023 (Prelims) Paper I

24th Feb 2023

Concessions:
50% OFF for ACE old students
75% OFF for ESE qualifed students

— Salient Features —

EXPERIENCED & ERUDIET FACULTY	REPLICA OF CLASSROOM	BACKUP CLASSES	FREE ONLINE TEST SERIES	FOCUSED & RELEVENT STUDY MATERIAL

41. An infinitely long current filament carrying 28.1A of current in the positive z direction. The magnetic field intensity, H, at $(\sqrt{20}, 0, 4)$

    (a) 0.1 ŷ A/m   (b) 10 ŷ A/m
    (c) 1 ŷ A/m   (d) 0.5 ŷ A/m

41. Ans: (c)

42. Consider the following statements about a phase controlled single-phase full-bridge converter using SCRs:

    A. The average output voltage at the dc side varies linearly with the firing angle

    B. The power factor at the ac input side depends on the converter firing angle

    C. The converter cannot be operated with firing angle greater than 90 degrees

    Which of the above statements is/are true?

    (a) B only   (b) A only
    (c) A and B only   (d) B and C only

42. Ans: (a)

43. A DC shunt motor with an armature resistance of 0.15Ω is supplied from 230V input supply. If the back emf of the motor is 200V, then the armature current will be equal to

    (a) 150A   (b) 250A
    (c) 100A   (d) 200A

43. Ans: (d)

44. Consider the following statements about the operation of a synchronous machine:

    A. the armature reaction in the generating modes aids the field flux when supplying a leading current

    B. the armature reaction opposes the field flux for a motor that draws a leading power factor current

    C. armature reaction in motoring mode always opposes the field excitation irrespective of the power factor.

    Which of the above statements is/are true?

    (a) B only   (b) A and B only
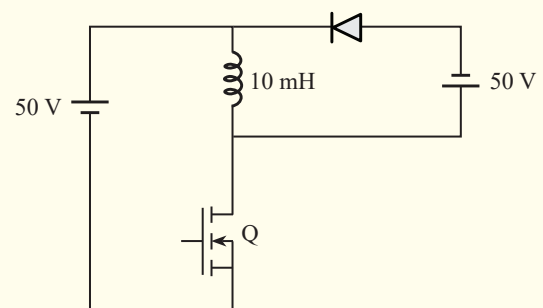   (c) A only   (d) B and C only

44. Ans: (b)

45. If the value of complex power flow in a certain transmission line is assumed to be fixed and if V denotes the sending end voltage of the line, then the real power loss in the line would be proportional to

    (a) V^{-1} (b) V^{-2}
    (a) V   (b) V^2

45. Ans: (b)

46. The MOSFET in the circuit shown below is operated as a switch at a frequency of 10kHz and duty ratio of 0.6. The initial inductor current is zero. If all the components can be assumed to be ideal, what would be the energy stored in the inductor at the end of 10 switching cycles?

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

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

(a) 0.01J   (b) 0.008J

(c) 0.005J   (d) 0.001J

46. Ans: (c)

47. In a salient pole synchronous generator with X_d and X_q denoting the reactance in the d and q axes, what is likely to be the relation between X_d and X_q?

(a) $X_d > X_q$ (b) $X_d = -X_q$

(c) $X_d < X_q$ (d) $X_d = X_q$

47. Ans: (a)

48. Consider the following statements made about the sequence impedance of power system components.

A. a fully transposed transmision line has equal positive and negative sequence impedances

B. the negative sequence impedance of a synchronous generator is usually smaller than the positive sequence impedance

C. the negative sequence impedance of a transformer is generally much higher than the positive sequence impedance

Which of the above statements is/are true?

(a) A and C only   (b) A only

(c) A and B only   (d) B and C only

48. Ans: (c)

49. A dynamometer type wattmeter is used to measure power of a room heater. Which option is correct?

(a) Current in the fixed coil is lower than the current in the moving coil

(b) Cannot comment on the relative currents in the moving and fixed coil

(c) Current in the fixed coil is same as the current in the moving coil

(d) Current in the fixed coil is more than the current in the moving coil

49. Ans: (d)

50. Find the type of feedback in the below circuit.
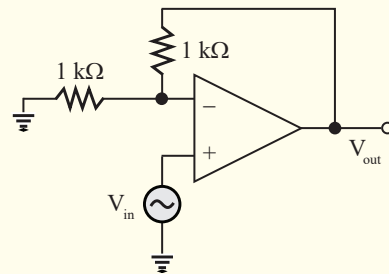
(a) Shunt - series feedback

(b) Shunt - shunt feedback

(c) Series - series feedback

(d) Serie - shunt feedback

50. Ans: (d)

51. What kind of filter is realized by the below circuit?
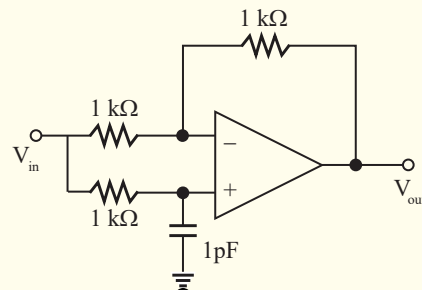
(a) Band-pass filter

(b) All-pass filter

(c) Low-pass filter

(d) High-pass filter

51. Ans: (b)

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.aceenggacademy.com

52. The decimal equivalent of the HEX number EF.A is
    (a) 239.625   (b) 239.16
    (c) 239.15   (d) 239.6

52. **Ans: (a)**

53. A three-phase full controlled converter (with 6 SCRs only) is feeding the armature of a separately excited DC motor. The motor has to also operate in quadrant-III. Which of the following methods is suitable?
    (a) By operating with triggering angle $\alpha > \pi/2$ rad
    (b) By connecting a free wheeling diode across the armature in addition to adjusting the triggering angle α
    (c) By adjusting the triggering angle α only
    (d) By adjusting the triggering angle α followed by armature connection reversal

53. **Ans: (d)**

54. A lamp takes 10A at 250V and emits 16000 Lumens. Determine its Mean Spherical Candle Power (MSCP).
    (a) $4000/\pi$ (b) 8000π
    (c) 2000π (d) 4000π

54. **Ans: (a)**

55. What is the effect on co-efficient of adhesion due to following conditions on rails?
    (a) it is high when the rails have grease
    (b) it is high when the rails are dry
    (c) it is high when the rails are oiled
    (d) it is high when the rails are wet

55. **Ans: (b)**

56. In a slip power recovery scheme of 3-phase induction motor drives, what is the operating speed with respect to the synchronous speed of the motor, if the power is injected into the rotor circuit from an external source?
    (a) motor speed is always below the synchronous speed
    (b) motor speed reduce to zero
    (c) motor speed is above the synchronous speed
    (d) motor speed is equal to the synchronous speed

56. **Ans: (a)**

57. What is the effect of AC side source inductance in SCR based phase-controlled rectifier operating with firing angle less than $\pi/2$ radians during R-L type loading condition, compared to that in zero source impedance condition?
    (a) Average output voltage remain unchanged
    (b) Average output voltage may increase or decrease
    (c) Average output voltage increases
    (d) Average output voltage decreases

57. **Ans: (d)**

58. Choose the correct statement.
    (a) Moore and Mealy machine outputs depend on both the input and the current state
    (b) Moore and Mealy machine outputs does not depend on input
    (c) Moore and Mealy machine outputs depends on input
    (d) Moore and Mealy machine outputs depends on current state

58. **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

59. Find the minimum sum-of-products representation for the Boolean expression.

$Z = \overline{X}Y + X\overline{Y} + XY$

(a) $\overline{X} + \overline{Y}$ (b) $\overline{X}\ \overline{Y}$

(c) XY   (d) X + Y

59. Ans: (d)

60. The octal representation of 111100010001 is

(a) 6512   (b) 6541

(c) 7421   (d) 7241

60. Ans: (c)

61. Which of the following can be the result of introducing an integral action in the forward path of a unity feedback system?

(a) faster system response

(b) reduced noise immunity

(c) elimination of steady state error

(d) increased stability margins

61. Ans: (c)

62. Which of these is responsible for developing the pressure in the working fluid cycle in a thermal power plant?

(a) feed water pump   (b) superheater

(c) steam turbine   (d) condenser

62. Ans: (a)

63. If u(t) denotes the unit step function, which of the following is an example of a bounded signal?

(a) $e^t \sin(t) u(t)$ (b) $t u(t)$

(c) $e^{2t} u(t)$ (d) $e^{-2t} u(t)$

63. Ans: (d)

64. Consider the following lists regarding speed control methods for dc motors:

A. Armature voltage

B. Field current control

C. Use of diverter resistor

D. Rheostatic voltage

1. Poor efficiency

2. Speed below based speed

3. Speed above base speed

4. DC series motor control

Choose the option in which all the items are correctly matched

(a) A–4,   B–2,   C–1,   D–3

(b) A–2,   B–1,   C–3,   D–4

(c) A–2,   B–3,   C–4,   D–1

(d) A–2,   B–3,   C–1,   D–4

64. Ans: (c)

65. Reducing the speed in a three-phase induction motor by using stator voltage control while supplying a constant torque load would result in

(a) higher airgap flux within the machine

(b) reduced efficiency

(c) reduction in rotor slip

(d) increased peak torque capability

65. Ans: (b)

66. In a transformer, the load current is kept constant, while the power factor is varied. Under this situation, zero voltage regulation will be observed

(a) at power factor equal to unity

(b) independent of load power factor

(c) load power factor is leading

(d) load power factor is lagging

66. Ans: (c)

ESE + GATE + PSUs - 2024

CLASSROOM COACHING @ KOTHAPET, HYDERABAD

Regular Batches

23rd Jan 2023	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

1st Feb 2023	
25th Feb 2023	11th Mar 2023

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

IRMSE-2023 (Prelims) Paper I

24th Feb 2023

Concessions:
50% OFF for ACE old students
75% OFF for ESE qualifed students
Rs. 5,000/- OFF Early Bird Discount

TS & AP GENCO/TRANSCO/DISCOMs

18th Jan 2023

50% OFF for ACE old students

67. The minimum value of anode current in an SCR that is required to sustain conduction in a thyristor with zero gate current is called
    (a) Base current
    (b) Fundamental current
    (c) Latching current
    (d) Holding current

67. Ans: (c)

68. What is Thevenin equivalent resistance of the network shown below?
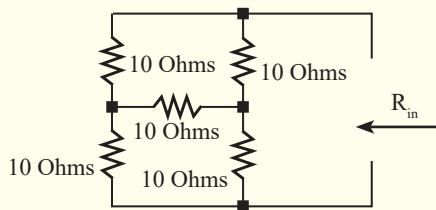
    (a) R_{in} = 20 Ohms
    (b) R_{in} = 10 Ohms
    (c) R_{in} = 40 Ohms
    (d) R_{in} = 30 Ohms

68. Ans: (b)

69. Consider three infinite uniform charge sheets located in a free space as follows: 1) $3nC/m^2$ at z = −2m, 2) $6nC/m^2$ at z = 0.5m, 3) $−8nC/m^2$ at z = 4m. The electric field at (2, 5, −5) is
    (a) −5.65 $\hat{z}$ V/m   (b) +5.65 $\hat{z}$ V/m
    (c) −56.5 $\hat{z}$ V/m   (d) +56.5 $\hat{z}$ V/m

69. Ans: (c)

70. In the circuit below, the power dissipated in the R_L as a function of R_L is schematically represented by which of the graph?
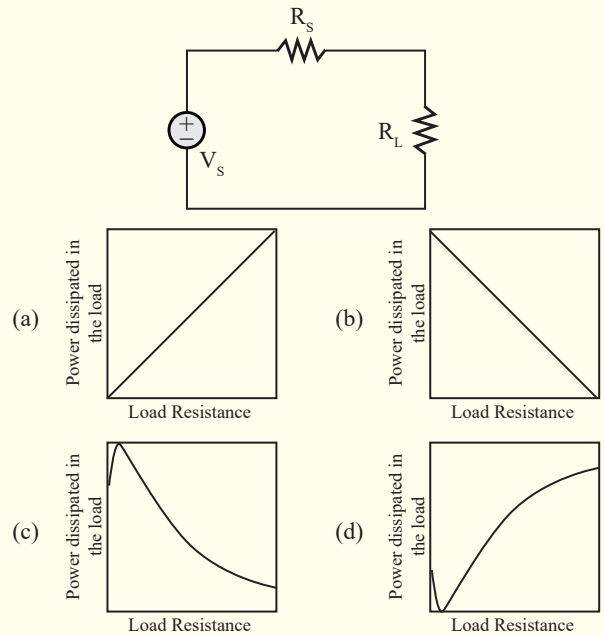
70. Ans: (d)

71. Calculate the magnetic field intensity, H, at (0.4, 0.3, 0) due to the 8A filamentary current directed from outward from origin to the infinity along the positive x axis and inward from the infinity to origin along the positive y axis as shown below.
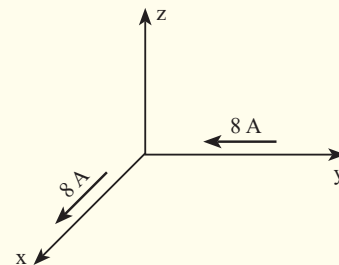
    (a) 63.7 $\hat{z}$ A/m   (b) − 63.7 $\hat{z}$ A/m
    (c) 6.37 $\hat{z}$ A/m   (d) − 6.37 $\hat{z}$ A/m

71. Ans: (c)
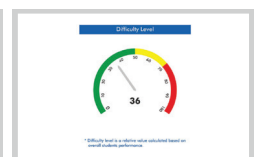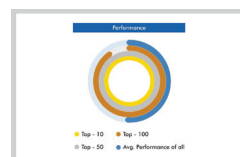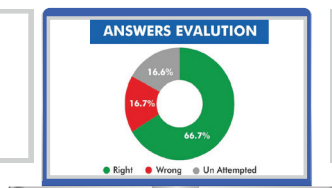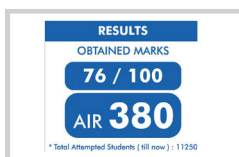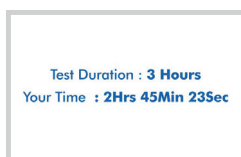
72. Consider the following statements about a triac:

    A. A triac has bidirectional current carrying capability as well as bidirectional voltage blocking capability

    B. A triac is functionally equivalent to two antiparallel connected thyristors

    C The triac can be turned on with both positive and negative gate currents

    Which of the above statements is/are true?

    (a) B and C only　　　　(b) A, B and C

    (c) A and B only　　　　(d) A and C only

72.　Ans: (b)

73. The stator of a three-phase, 4-pole squirrel cage induction motor rated for 1450 rpm at 50 Hz, is rewounded to have six poles without any change made on the rotor. This motor would then

    (a) operate with speed slightly above 1800 rpm at 50 Hz

    (b) run at the same speed with higher torque rating

    (c) operate with speed slightly below 1000 rpm at 50Hz

    (d) fail to develop any torque

73.　Ans: (c)

74. Consider the following statements about a dc series motor:

    A. the developed torque in the machine is directly proportional to the current in the machine

    B the motor is suitable only for loads having a small starting torque

    C. the machine can run even when a single phase ac supply is applied across its terminals

Which of the above statements is/are true?

(a) A, B and C　　　　(b) C only

(c) A and B only　　　　(d) B and C only

74.　Ans: (b)

75. Which of the following represents the transfer function of a zero-order hold with sample period T?

    (a) $s(1 - e^{-sT})$　　　　(b) $s(1 + e^{-sT})$

    (c) $\dfrac{1 - e^{-sT}}{s}$　　　　(d) $\dfrac{1 + e^{-sT}}{s}$

75.　Ans: (c)

76. For the open loop transfer function of a system is given as $G(s)H(s) = \dfrac{\pi e^{-0.25s}}{s}$, the gain crossover frequency in rad/sec is

    (a) $\pi/4$　　　　(b) 2π
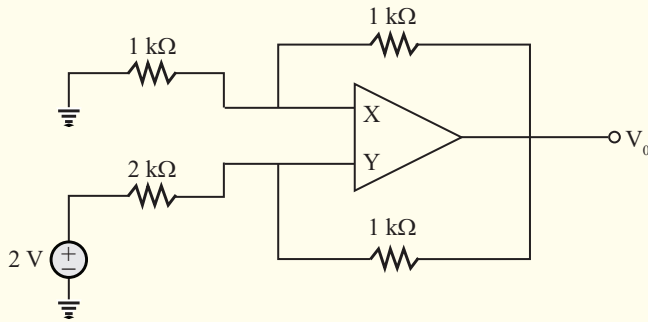
    (c) π　　　　(b) $\pi/2$

76.　Ans: (c)

77. Gauss-Siedel technique is commonly used in power systems for which of the following?

    (a) Unit Commitment　　　(b) Stability Analysis

    (c) Load flow Analysis　　　(b) Fault Analysis

77.　Ans: (c)

78. A balanced three-phase supply feeds power to a balanced three-phase R-L load. Under this condition, the total instantaneous power supplied to the load would be

    (a) Pulsating with non-zero average

    (b) Zero

    (c) Constant

    (b) Pulsating with zero average

78.　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

79. In the circuit below, find the terminals of X and Y, for the circuit to be in negative feedback.

(a) Any of the terminals can be negative or positive
(b) Circuit will never be in negative feedback
(c) X negative and Y positive
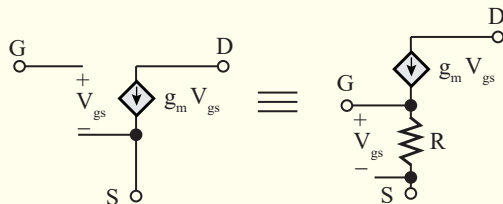(d) X positive and Y negative

79. Ans: (d)

80. What is the hexadecimal conversion of this binary number 1111?
   (a) A   (b) F
   (c) 4   (d) 8

80. Ans: (b)

81. For the two circuits to be equivalent, R should be equal to

   (a) $\dfrac{1}{g_m}$ (b) $\dfrac{1}{(2g_m)}$
   (c) 0   (b) infinity

81. Ans: (a)

82. Which of the following load offers characteristic close to a constant load torque?
   (a) Fan type of load
   (b) Water pumping load
   (c) Traction load
   (b) Low speed hoist

82. Ans: (d)

83. Which of the following is used in overhead power supply for AC electric locomotive in India?
   (a) 415V, Three phase
   (b) 25kV, Single phase
   (c) 110kV, Single phase
   (b) 330 kV, Single phase

83. Ans: (b)

84. Which of the following statements are entirely true regarding Eddy current?
   (a) Eddy current loss can be minimized by thin laminate core and Eddy current is proportional to the flux frequency
   (b) Eddy current loss can be minimized by using material which have low hysteresis coefficient and Eddy current is proportional to the square of the flux frequency
   (c) Direction of Eddy current can be found by Lenz's law and Eddy current is proportional to the square of the flux frequency
   (d) Eddy current loss can be minimized by using material which have low hysteresis coefficient and Eddy current is proportional to the flux frequency

84. 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*

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

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

85. Which of the following statements is true in the case of dynamic braking of separately excited DC motor?
  (a) The voltage supply/source is removed and the armature terminals are connected to a resistance
  (b) The voltage supply/source is reversed keeping armature terminal fixed
  (c) The armature terminals are reversed and the voltage supply/source is present
  (b) The voltage supply/source is removed and the armature terminals are shorted

85. Ans: (a)

86. What is the time period of oscillation of V_{out}?
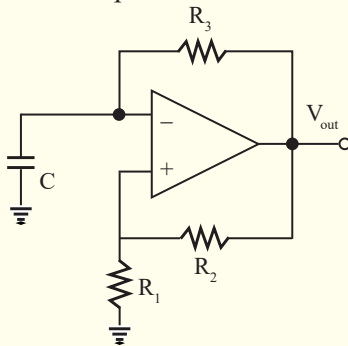
  (a) $2\dfrac{R_1}{R_2}R_3C\ln\left(1+\dfrac{2R_1}{R_2}\right)$

  (b) $2\dfrac{R_2}{R_1}R_3C\ln\left(1+\dfrac{2R_2}{R_1}\right)$

  (c) $2R_3C\ln\left(1+\dfrac{2R_1}{R_2}\right)$

  (d) $2\dfrac{R_2}{R_1}R_3C\ln\left(1+\dfrac{2R_1}{R_2}\right)$

86. Ans: (c)

87. Which bridge can be used for measuring relative permeability?
  (a) Schering   (b) Anderson
  (c) Wheatstone   (d) Kelvin

87. Ans: (b)

88. Find the type of filter shown below.
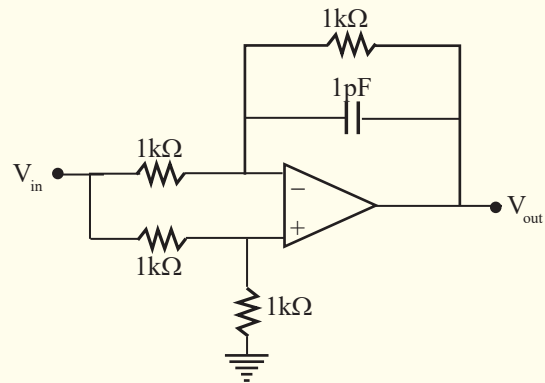
  (a) Band-pass filter   (b) Band-stop filter
  (c) Low-pass filter   (d) High-pass filter

88. Ans: (d)

89. For the circuit below, find the value of current I_x.
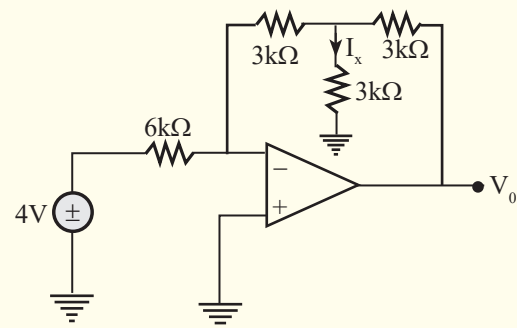
  (a) −0.67 mA   (b) −0.33mA
  (c) 0.33mA   (d) 0.67mA

89. Ans: (a)

90. Which of the following could be the effect of using high-speed circuit breakers in a power system?
    (a) Increased short circuit current
    (b) Reduced system reliability
    (c) Improved system stability
    (d) Reduced short circuit current

90. Ans: (c)

91. An ideal diode connected in series with pure inductance is supplied from an ideal AC voltage source. Then for what duration in radians will the diode conduct, with respect to the AC voltage waveform?
    (a) $\pi/2$ (b) $\pi/4$
    (c) 2π (d) π

91. Ans: (c)

92. The impedance of a three phase transmission line in ohms is given as $Z_{line} = 5 + j10$. If the line delivers 100 MVA of power at 400 kV, what would be the transmission power loss in the line?
    (a) 356 kW   (b) 104 kW
    (c) 621 kW   (d) 210 kW

92. Ans: (b)

93. The characteristic polynomial of a linear system is given as $s^4 + 3s^3 + 5s^2 + 6s + K + 10 = 0$. What should be the condition on K so that the system is stable?
    (a) $K > -10$ (b) $-10 < K < -4$
    (c) $K > 10$ (d) $K > -4$

93. Ans: (b)

94. Consider the following statements about the armature mmf wave in a dc machine
    A. The mmf waveform has a sinusoidal shape.
    B. The mmf waveform has a triangular shape.
    C. The mmf waveform rotates with respect to the armature
    D. The armature waveform rotates wtih respect to the stator.
    Which of the above statements is/are true?
    (a) B and C only   (b) B and D only
    (c) A and C only   (d) A and D only

94. Ans: (a)

95. In a grid-connected synchronous generator working at unity power factor, increasing the field excitation has the effect of
    (a) Increasing both active power and reactive power supplied to the grid
    (b) Increasing the operating frequency of the grid.
    (c) Increasing only the active power supplied to the grid
    (d) Increasing only the reactive power supplied to the grid

95. Ans: (d)

96. A voltage source inverter is most suitable in applications where
    (a) Both source and load have large inductances
    (b) Both source and load have small inductances
    (c) Source has a large inductance and the load has a small inductance
    (d) Source has a small inductance and load inductance is large
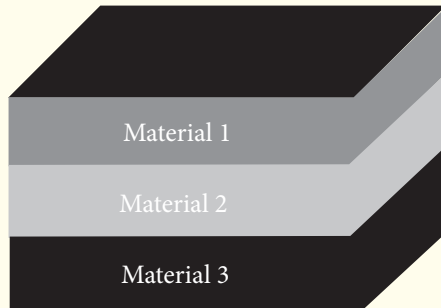
96. Ans: (d)

97. Which of the following is the function of an R-C snubber circuit connected in parallel to an SCR?
    (a) Forced commutation of the SCR
    (b) Limiting the di/dt through the SCR
    (c) Triggering the SCR
    (d) Preventing over voltages across the SCR

97. Ans: (d)

98. A parallel plate capacitor is made with three dielectrics placed between two metal electrodes.

Material 1

Material 2

Material 3

The thickness of Material 1, Material 2 and Material 3 is d_1, d_2, d_3 respectively. The dielectric constant for Material 1, Material 2 and Material 3 is ε_1, ε_2, ε_3 respectively. The capacitance per unit area of this system is given by

(a) $C = \left[\dfrac{d_1}{\varepsilon_1} + \dfrac{d_3}{\varepsilon_3}\right]^{-1}$

(b) $C = \dfrac{d_1}{\varepsilon_1} + \dfrac{d_3}{\varepsilon_3}$

(c) $C = \left[\dfrac{d_1}{\varepsilon_1} + \dfrac{d_2}{\varepsilon_2} + \dfrac{d_3}{\varepsilon_3}\right]^{-1}$

(d) $C = \dfrac{d_1}{\varepsilon_1} + \dfrac{d_2}{\varepsilon_2} + \dfrac{d_3}{\varepsilon_3}$

98. Ans: (c)

99. A two port network has the following impedance parameters (all in Ω) $z = \begin{bmatrix} 10^2 & 1 \\ -10^5 & 10^3 \end{bmatrix}$

The input is connected to a sinusoidal voltage source V_s, having 50Ω of series resistance. A $1k\Omega$ load resistance is connected. Calculate the voltage gain of the network
    (a) $G_v = 10^5$
    (b) $G_v = -10^5$
    (c) $G_v = -\dfrac{1000}{3}$
    (d) $G_v = \dfrac{1000}{3}$

99. Ans: (c)

100. Consider a circuit shown below with DC supply ($V_S = 5V$). The series resistance (R_S) of 5Ω is connected as shown. Maximum power dissipated in the R_L is
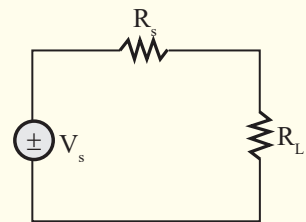
    (a) 1.25W   (b) 0.00125W
    (c) 0.0125W   (d) 0.125W

100. Ans: (a)

101. The Laplace transform of the differential equation $y'' + ay' + by = f(t)$. Assume that $y(0) = 5$, $y'(0) = 10$, $Y(s)$ and $F(s)$ are the Laplace transforms of $y(t)$ and $f(t)$ respectively
    (a) $s^2Y + 5s + 10 + a(sY + 5) + bY = R(s)$

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

(b) $s^2Y + 10s + 5 + a(sY + 10) + bY = R(s)$

(c) $s^2Y - 5s - 10 + a(sY - 5) + bY = R(s)$

(d) $s^2Y - 10s - 5 + a(sY - 10) + bY = R(s)$

101. Ans: (c)

102. Consider the following devices and their characteristics

A. Schottky Diode

B. Silicon Controlled Rectifier

C. IGBT

D. BJT

1. Current controlled turn-on and turn-off

2. Majority carrier device

3. Voltage controlled turn-on and turn-off

4. Four layer device structure

Choose the option in which all the items are correctly matched.

(a) A-4, B-2, C-1, D-3

(b) A-2, B-1, C-3, D-4

(c) A-1, B-2, C-3, D-4

(d) A-2, B-4, C-3, D-1

102. Ans: (d)

103. The maximum efficiency of a single phase transformer operating at unity power factor is found to be 90% under full load conditions. The efficiency at half load at the same power factor would be

(a) 88.3%   (b) 90%

(c) 84.5%   (d) 87.5%

103. Ans: (b)

104. In a single-phase SCR based full-converter with continuous conduction operating with firing angle α, what is the angle duration of conduction for each pair of SCRs in radians?

(a) π (b) α

(c) $\pi - \alpha$ (d) $\pi + \alpha$

104. Ans: (a)

105. Consider a linear system represented in state space form as shown below:

$$x = \begin{bmatrix} 0 & 1 \\ -3 & -6 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

$y = [1 \ 0] x$

Which of the following is true for this system?

(a) The system is stable, controllable and observable

(b) The system is stable and observable, but not controllable

(c) The system is stable and controllable but not observable

(d) The system is controllable and observable, but unstable

105. Ans: (a)

106. A three-phase induction motor rated at 15hp, 440V has an efficiency of 85% and operates at a power factor of 0.9 (lag), while delivering rated output power. What would be the reactive power drawn by the motor under this condition?

(a) 8.21kVAr   (b) 5.11kVAr

(c) 7.42kVAr   (d) 6.38kVAr

106. Ans: (d)

107. A dc shunt motor supplied from a 220 V DC input supply runs at 1200 rpm. Neglecting all losses and saturation, what would be the speed when the same motor is supplied from a 175 V DC input?

(a) 1200 rpm   (b) 1100 rpm

(c) 750 rpm   (d) 950 rpm

107. Ans: (a)

108. 4 μA current flows through a conductor for 4s. Find the number of electrons passed through the conductor.

(a) $1e^{14}$ (b) $16e^{14}$

(c) $16e^{-6}$ (d) 16

108. Ans: (a)

109. Two 10-bit ADCs, one of successive approximation type and other of single slope integrating type, take Ta and Tb time respectively to convert 3V analog input signal to digital output. If the input analog signal is increased to 6V, the approximate time taken by the two ADCs will respectively be

(a) 2Ta, Tb   (b) 2Ta, 2Tb

(c) Ta, Tb   (d) Ta, 2Tb

109. Ans: (c)

110. A bipolar junction transistor is

(a) a charge-controlled device

(b) a field-controlled device

(c) a voltage-controlled device

(d) a current-controlled device

110. Ans: (d)

111. What is the way of imparting braking action of three phase induction motor in plugging scheme?

(a) By reversal of the phase sequence of the stator

(b) By increasing the stator voltage magnitude

(c) By decreasing the stator voltage magnitude

(d) By decreasing synchronous speed

111. Ans: (a)

112. Which of the following statements is correct in the case of multi-loop based close-loop control of DC and AC drives having speed and current feedbacks?

(a) Current control loop is faster than the speed control loop

(b) Output of current control provides the reference speed

(c) Speed control loop is faster than the current control loop

(d) Speed control and current control loops have equal bandwidth.

112. Ans: (a)

113. What happens in coasting mode of an electric traction?

(a) Regenerative braking is provided to recover the energy from locomotive

(b) Continuous power is provided by the electric drive to maintain the locomotive speed

(c) The power supply is cut off and the train is allowed to run with its own inertia

(d) Electric drive accelerates the motor from standstill condition to the rated speed

113. Ans: (c)

114. What is the status of machine flux, for the range of frequency above the rated (base) frequency, in the case of a speed regulated V/f controlled induction motor drive?

(a) Machine flux unchanged

(b) Machine flux may increase or decrease based on load

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

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.
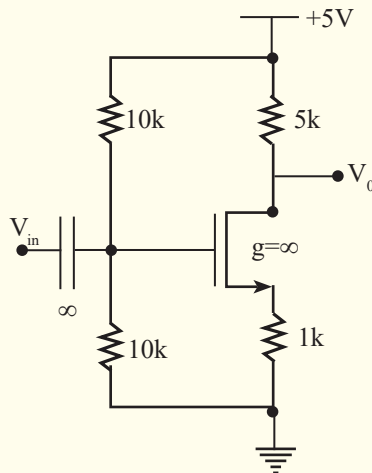

APPSC

KPSC

TSPSC

MPPSC

TNPSC

MPSC

OPSC

MPPEB

MAHAGENCO/
TRANSCO/DISCOMs

GENCO/TRANSCO
/DISCOMs
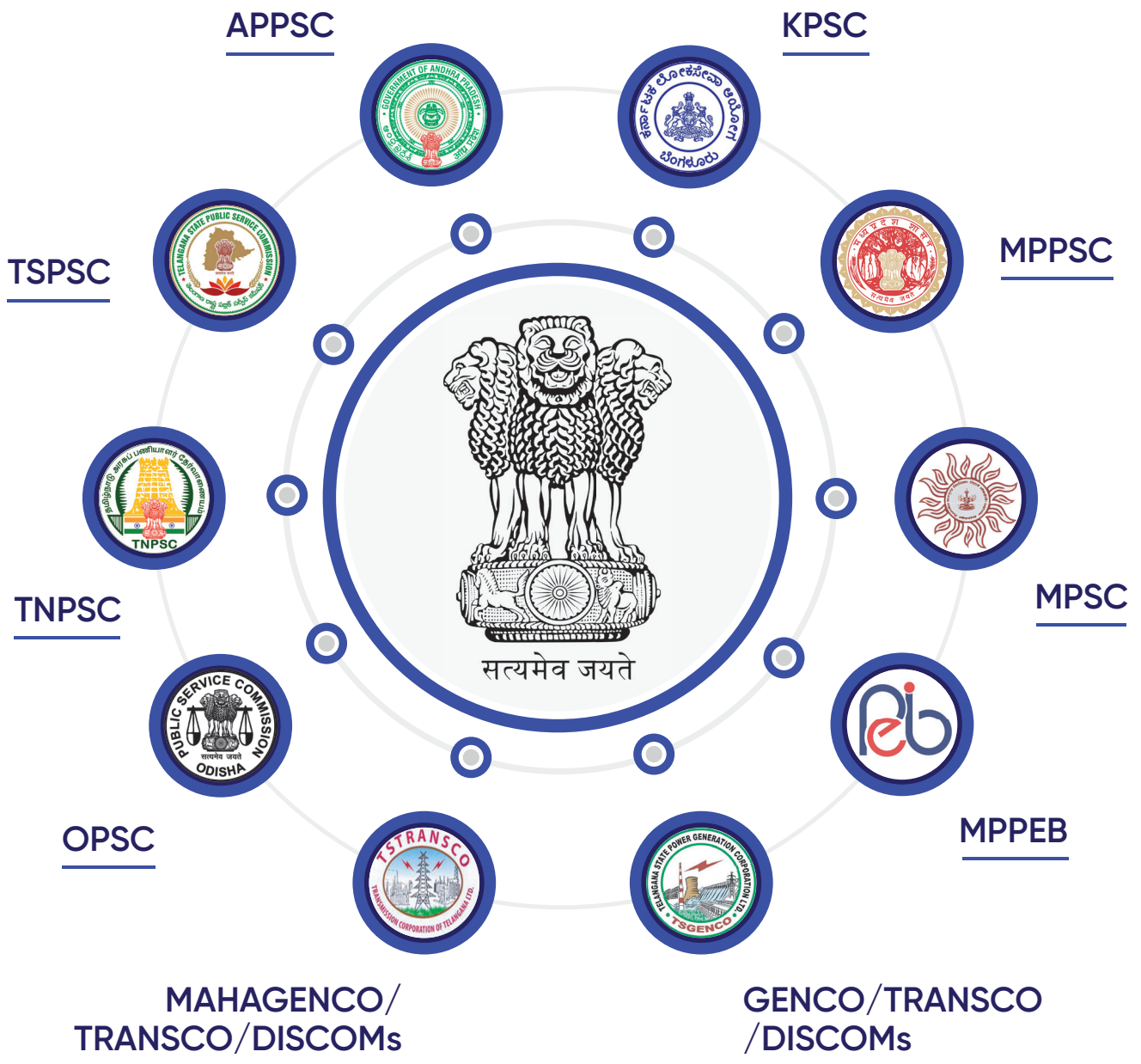
(c) Machine flux increases from the rated flux

(d) Machine flux decreases from the rated flux

114. Ans: (d)

115. What is the small-signal gain of below circuit?

(a) −4   (b) −5

(c) 4   (d) 5

115. Ans: (b)

116. The following gates are designated as Universal Gates

(a) NOR and NAND

(b) NOT, OR and AND

(c) XOR, OR and AND

(d) XNOR, NOR and NAND

116. Ans: (a)

117. In a three-phase bridge inverter operating in the square wave mode, the output voltage waveform contains

(a) Only even order harmonics

(b) Both even and odd order harmonics, but no triplen harmonics

(c) Only triplen order harmonics

(d) Only odd order harmonics

117. Ans: (d)

118. An electric machine wherein the self-inductances of both stator and rotor windings are independent of the rotor position will NOT develop any

(a) Hysteresis torque   (b) Synchronizing torque

(c) Starting torque   (d) Reluctance torque

118. Ans: (a)

119. If the Nyquist plot of the open loop transfer function $G(s)H(s)$ of a system passes through the $-1 + j0$ point, then the phase margin of this system is likely to be

(a) 90 degrees   (b) 45 degrees

(c) 180 degrees   (d) 0 degree

119. Ans: (d)

120. At low values of operating slip, the torque developed in a three-phase induction motor is

(a) inversely proportional to slip

(b) proportional to the square of slip

(c) linearly proportional to slip

(d) independent of slip

120. Ans: (c)

121. The pole zero plot shown below represents a system whose frequency response is approximately that of 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
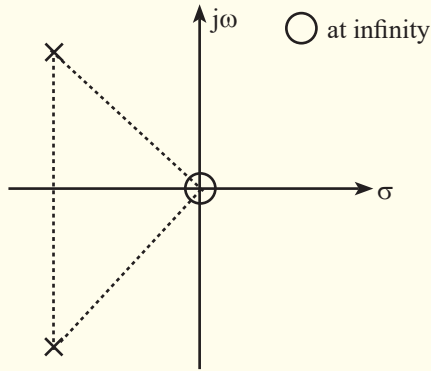
(a) Notch filter   (b) Bandpass filter
(c) Low pass filter   (d) High pass filter

121. Ans: (c)

122. If P_e and P_h denote the eddy current loss and hysteresis loss in a magnetic core operating with an alternating flux density waveform of frequency f, then

(a) P_e and P_h are both proportional to f^2
(b) The total loss $(P_e + P_h)$ is proportional to f
(c) P_e is proportional to f and P_h is proportional to f^2
(d) P_e is proportional to f^2 and P_h is proportional to f

122. Ans: (d)

123. Consider a coaxial cable having inner radius of 0.8mm and outer radius of 4 mm and filled with a material having a relative permeability of 50. The self-inductance will be

(a) $32.2\mu H/m$ (b) $32.2\mu H$
(c) $16.1\mu H/m$ (d) $16.1\mu H$

123. Ans: (c)

124. A set of 4-point charges of $3\mu C$ are placed at (1, 1, 0), (–1, 1, 0), (–1, –1, 0) and (1, –1, 0) in a space with relative permittivity of 2.
Calculate the resultant electric field at the (1, 1, 1).
(a) $\vec{E} = 16.4\,\hat{x} + 16.4\,\hat{y} + 3.41\,\hat{z}$ kV/m
(b) $\vec{E} = -16.4\,\hat{x} - 16.4\,\hat{y} + 3.41\,\hat{z}$ kV/m
(c) $\vec{E} = -3.41\,\hat{x} - 3.4l\,\hat{y} + 16.4\,\hat{z}$ kV/m
(d) $\vec{E} = 3.41\,\hat{x} + 3.4l\,\hat{y} + 16.4\,\hat{z}$ kV/m

124. Ans: (d)

125. Any periodic function f(x) with a period of 2L can be written as

$$f(x) = k + \sum_{i=1}^{\infty}\left(a_i\cos\left(\frac{i\pi}{L}x\right) + b_i\sin\left(\frac{i\pi}{L}x\right)\right)$$

Given that f(x) is an even function. Which of the following option is correct ?
(a) $b_i = 0$ (b) $k \neq 0,\ a_i \neq 0,\ b_i \neq 0$
(c) $k = 0$ (d) $a_i = 0$

125. Ans: (a)

126. Consider a series RL circuit shown below
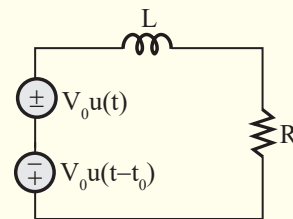
u(t) and $u(t - t_0)$ are unit step functions. The current flowing through the resistance R at time t > 0 is given by

(a) $i(t) = \dfrac{V}{R}e^{\frac{Rt_0}{L}}\left(e^{\frac{-Rt}{L}} - 1\right)$

(b) $i(t) = \dfrac{V}{R}e^{\frac{-Rt_0}{L}}\left(e^{\frac{-Rt}{L}} - 1\right)$

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.

Central Water Commission

Central Public Works Dept. (CPWD)

Military Engineer Services (MES)

Farakka Barrage Project

National Technical Research Organisation

Directorate of Quality Assurance (Naval)

Central Water Power Research Station

Border Roads Organisation

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

www.ace.online | www.aceenggacademy.com

(c) $i(t) = \dfrac{V}{R} e^{\frac{-Rt}{L}} \left(e^{\frac{Rt_0}{L}} - 1 \right)$

(d) $i(t) = \dfrac{V}{R} e^{\frac{-Rt}{L}} \left(e^{\frac{-Rt_0}{L}} - 1 \right)$

126. Ans: (c)

127. Calculate the amount of the point charge at the origin given that the potential at $(-2, 3, 1)$ is 36 V and reference is taken to be at infinity.
   (a) Q = 7.5 nC
   (b) Q = 1.5 nC
   (c) Q = 15 nC
   (d) Q = 30 nC

127. Ans: (c)

128. A step up chopper delivers an average output voltage of 100 V from an input supply of 60 V when operating with a continuous source current. What is the operating duty ratio for the switch ?
   (a) 2/3
   (b) 1/3
   (c) 0.6
   (d) 0.4

128. Ans: (d)

129. For the parallel operation of 2 single-phase transformers with same voltage ratio and different kVA ratings, the load is shared by these transformers in proportion to their kVA ratings when the transformers have
   (a) leakage reactance in ohms inversely proportional to their ratings.
   (b) equal per unit impedances on their respective ratings.
   (c) the same leakage reactance in ohms.
   (d) the same magnetising reactance in ohms.

129. Ans: (b)

130. A three phase induction motor with a 6-pole winding is rotating at 1200 rpm. The speed of rotation in electrical and mechanical radians per second are respectively
   (a) 40π, $40\pi/3$
   (b) $40\pi/3$, 40π
   (c) 120π, 40π
   (d) 40π, 120π

130. Ans: (c)

131. What is the SNR of an ideal 10 bit ADC ?
   (a) 71.96 dB
   (b) 81.96 dB
   (c) 51.96 dB
   (d) 61.96 dB

131. Ans: (d)

132. A motor-load combination operating in motoring mode (quadrant-1) has the following speed torque characteristics :
   T(motor) = 0.1 N - 10 (N-m)
   T(load) = 0.25 N - 75 (N-m)
   where T(motor) is a motor torque in N-m,
   T(load) is a load torque in N-m and N is a speed of the motor-load combination in RPM. What is the steady state speed of the system after exciting it ?
   (a) 700 RPM
   (b) 666.3 RPM
   (c) 433.3 RPM
   (d) 0 RPM

132. Ans: (c)

133. Which type of transformers is used in AC welding ?
   (a) Step down type
   (b) Equal turns ratio type
   (c) Ferrite core type
   (d) Step up type

133. Ans: (a)

134. A 200 Volt, 1200 RPM, 100 Amp DC separately excited motor has an armature resistance of 0.1Ω. It is braked by plugging from initial speed of 1200 RPM. What is the external resistance to be placed in series with the armature circuit to limit the braking current to twice the full load value ?
     (a) 10.2 Ω   (b) 7.33 Ω
     (c) 1.5 Ω   (d) 3.8 Ω
134. Ans: (*)

135. A 200 Volt, 1000 RPM, 100 Amp separately excited dc motor has an armature resistance of $0.1\ \Omega$. The motor is fed from a DC-DC step down chopper. The input dc source has a voltage of 300 Volt to this chopper. What is the duty cycle of the chopper for motoring operation at rated torque and speed of 500 RPM assuming operation with continuous conduction and field flux remains unchanged ?
     (a) 0.50   (b) 0.35
     (c) 0.25   (d) 0.84
135. Ans: (b)

136. In a long transmission line operating under lightly loaded conditions, the receiving end voltage is found to be higher than the sending end voltage. Which effect accounts for this phenomenon ?
     (a) Proximity effect
     (b) Skin effect
     (c) Corona effect
     (d) Ferranti effect
136. Ans: (d)

137. Which of the following represents an expression for the damping factor in a series R-L-C circuit?
     (a) $\dfrac{RC}{2L}$ (b) $R\sqrt{LC}$
     (c) $\dfrac{R\sqrt{C}}{2\sqrt{L}}$ (d) $\dfrac{R\sqrt{C}}{2L}$
137. Ans: (c)

138. If the magnetic circuit in a dc machine is operating under saturated conditions, then the armature reaction in the machine results in
     (a) decrease in the value of flux per pole
     (b) increase or decrease depending on motoring or generating mode of operation
     (c) increase in the value of flux per pole
     (d) no change in the value of flux per pole
138. Ans: (a)

139. Initially the switch is closed, and steady state has been reached. At t = 0 the switch is opened. What is the voltage across the capacitor at $t = 0^+$?
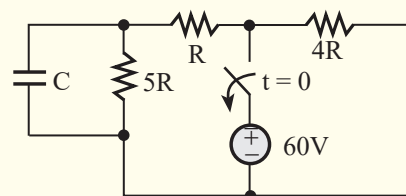
     (a) 0 V   (b) 60 V
     (c) 10 V   (c) 50 V
139. Ans: (d)

140. Which of the following is a characteristic of an ideal transformer ?
     (a) Infinite core reluctance

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

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.
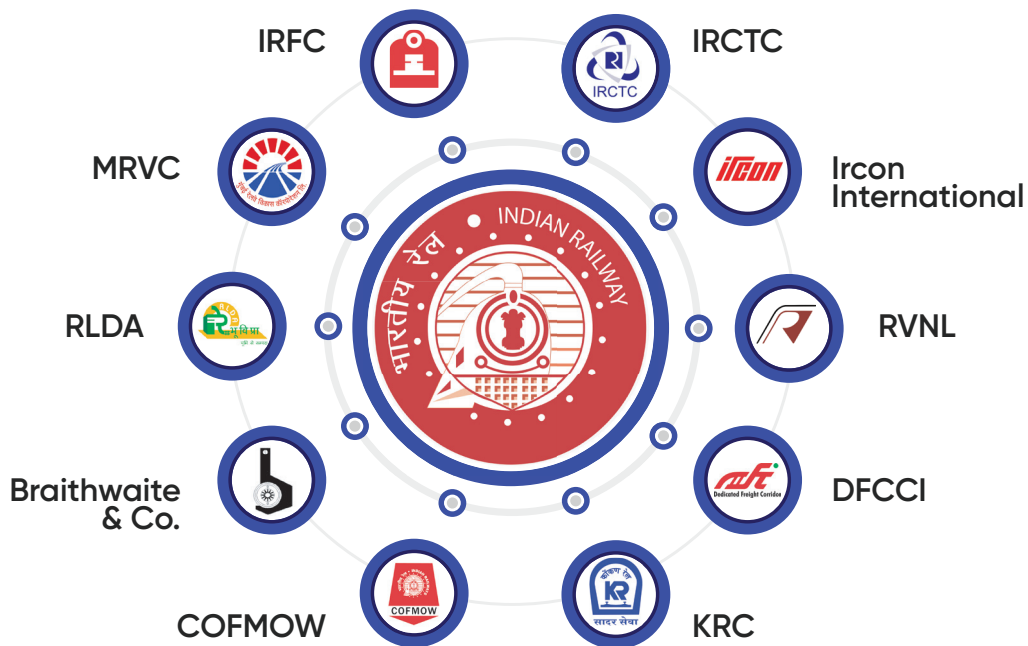
CUT-OFF MARKS

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

(b) Zero stored magnetic energy

(c) Large magnetising current

(d) Zero core flux

140. Ans: (b)

141. Consider a circuit below with $R_p = 5\Omega$.
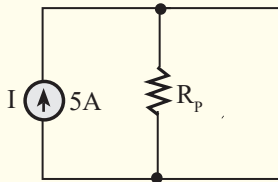
It is equivalent to which one of the following?

(a)

(b)

(c)

(d)
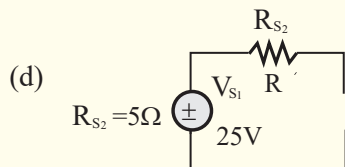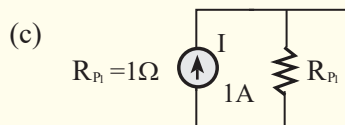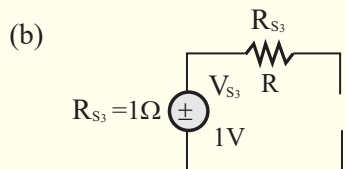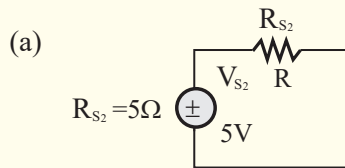
141. Ans: (d)

142. Which of the following transformation between the z (impedance) and h (hybrid) parameters is correct?

(a) $z = \begin{bmatrix} \dfrac{h_{11}h_{22} - h_{12}h_{21}}{h_{22}} & \dfrac{-h_{12}}{h_{22}} \\ \dfrac{-h_{21}}{h_{22}} & \dfrac{1}{h_{22}} \end{bmatrix}$

(b) $z = \begin{bmatrix} \dfrac{h_{11}h_{22} - h_{12}h_{21}}{h_{22}} & \dfrac{h_{12}}{h_{22}} \\ \dfrac{h_{21}}{h_{22}} & \dfrac{1}{h_{22}} \end{bmatrix}$

(c) $z = \begin{bmatrix} \dfrac{h_{11}h_{22} - h_{12}h_{21}}{h_{22}} & \dfrac{h_{12}}{h_{22}} \\ \dfrac{-h_{21}}{h_{22}} & \dfrac{1}{h_{22}} \end{bmatrix}$

(d) $z = \begin{bmatrix} \dfrac{h_{11}h_{22} - h_{12}h_{21}}{h_{22}} & \dfrac{h_{12}}{h_{22}} \\ \dfrac{-h_{21}}{h_{22}} & \dfrac{-1}{h_{22}} \end{bmatrix}$

142. Ans: (c)

143. Which of the following is correct regarding Eddy currents in the coil ?

(a) By making use of a laminated core, Eddy currents are increased

(b) Eddy currents converts useful energy into heat and waste it

(c) Eddy currents flow in straight lines, like a wire and complete circuit path without power loss

(d) Eddy current helps in generating electrical energy

143. 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

144. Find the polarity of op-amp input for negative feedback operation.
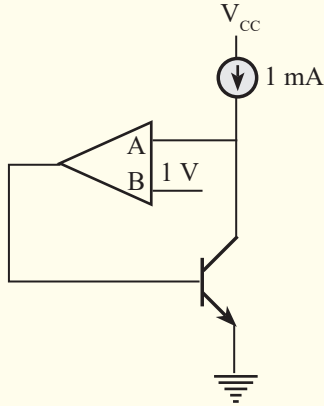
(a) The circuit will never operate in negative feedback

(b) The circuit will always operate in negative feedback irrespective of the op-amp input polarity

(c) A is positive and B is negative

(d) A is negative and B is positive

144. Ans: (c)

145. The resonance frequency, ω_0, for the circuit shown below is
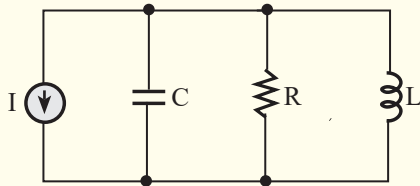
(a) $\omega_0 = \dfrac{1}{\sqrt{LC}}$ Hz

(b) $\omega_0 = \dfrac{1}{RC} + \dfrac{R}{L} + \dfrac{1}{\sqrt{LC}}$ Hz

(c) $\omega_0 = \dfrac{1}{RC}$ Hz

(d) $\omega_0 = \dfrac{R}{L}$ Hz

145. Ans: (a)

146. The output of the circuit is taken across the resistance. The bandwidth of the circuit shown is
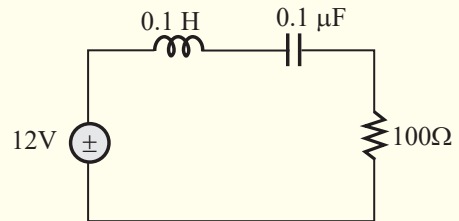
(a) 1M rads   (b) 10M rads

(c) 1k rads   (d) 100k rads

146. Ans: (c)

147. The Fourier series of a function described below

$f(x) = x + \pi; -\pi < x < \pi$

$f(x + 2\pi) = f(x)$

is given by which of the following options ?

(a) $\pi + \sum\limits_{n=1}^{\infty}\left(-\dfrac{2}{n}\sin(n\pi)\right)\cos(nx)$

(b) $\dfrac{\pi}{2} + \sum\limits_{n=1}^{\infty}\left(-\dfrac{2}{n}\sin(n\pi)\right)\cos(nx)$

(c) $\pi + \sum\limits_{n=1}^{\infty}\left(-\dfrac{2}{n}\cos(n\pi)\right)\sin(nx)$

(d) $\dfrac{\pi}{2} + \sum\limits_{n=1}^{\infty}\left(-\dfrac{2}{n}\cos(n\pi)\right)\sin(nx)$

147. 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

148. Consider a coaxial capacitor having inner radius of 0. 1045 m and outer radius of 0.68 m and having a length of 0.3048 m. Assume the dielectric to be air. The capacitance is

(a) 9.05 nF   (b) 90.5 nF

(c) 9.05 pF   (d) 90.5 pF

148. Ans: (c)

149. In rotor resistance control of an induction motor, which one of the following is true with increase in rotor resistance ?

(a) Maximum torque increases, starting torque increases and the slip at which maximum torque occurs increases

(b) Maximum torque remains unchanged, starting torque increases and the slip at which maximum torque occurs increases

(c) Maximum torque increases, starting torque increases and the slip at which maximum torque occurs decreases

(d) Maximum torque remains unchanged, starting torque decreases and the slip at which maximum torque occurs increases

149. Ans: (b)

150. Which type of material is used for filament illumination in the incandescent lamp ?

(a) Silicon   (b) Tungsten

(c) Copper   (d) Aluminum

150. 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

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

67 AIR 1ST IN GATE

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

27 AIR 1ST IN ESE

and many more...

📞 +91-7799 99 6602   ✉ help@ace.online