



GATE-2018
All India Mock GATE Test Series
Electrical Engineering
Test Series 4

Name:

Test ID: **EE-TS-04-18**

Duration: 3 hours

Maximum marks : 100

Please read the following instructions carefully

General Instructions

1. Total duration of examination is 180 minutes (3 hours).
2. The clock will be set at the server. The countdown timer in the top right corner of screen will display the remaining time available for you to complete the examination. When the timer reaches zero, the examination will end by itself. You will not be required to end or submit your examination.
3. The Question Palette displayed on the right side of screen will show the status of each question using one of the following:
 - a. You have not visited the question yet.
 - b. You have not answered the question.
 - c. You have answered the question.
 - d. You have NOT answered the question, but have marked the question for review.
 - e. You have answered the question, but marked it for review.

The **Marked for Review** status for a question simply indicates that you would like to look at that question again. If a question is answered and **Marked for Review**, your answer for that question will be considered in the evaluation.

Navigating to a Question

4. To answer a question, do the following:
 - a. Click on the question number in the Question Palette to go to that question directly.
 - b. Select an answer for a multiple choice type question by clicking on the bubble placed before the 4 choices namely A, B, C, D. Use the virtual numeric keypad to enter a number as answer for a numerical type question.
 - c. Click on **Save and Next** to save your answer for the current question and then go to the next question.
 - d. Click on **Mark for Review and Next** to save your answer for the current question, and also mark it for review, and then go to the next question.
 - e. **Caution:** Note that your answer for the current question will not be saved, if you navigate to another question directly by clicking on its question number without saving the answer to the previous questions.
 - f. You can view all the questions by clicking on the **Question Paper** button. This feature is provided, so that if you want you can just see the entire question paper at a glance.

Answering a Question

5. Procedure for answering a multiple choice (MCQ) type question:
 - a. To select your answer, click on the bubble button of one of the options
 - b. To deselect your chosen answer, click on the bubble button of the chosen option again or click on the clear response button
 - c. To change your chosen answer, click on the bubble button of another option
 - d. To save your answer, you **MUST** click on the **Save and Next button**.
 - e. To mark the question for review, click on the **Mark for Review and Next** button. If an answer is selected for a question that is Marked for Review, that answer will be considered in the evaluation.

6. Procedure for answering a numerical answer type question:

- a. To enter a number as your answer, use the virtual numerical keypad
 - b. A fraction (eg. -0.3 or $-.3$) can be entered as an answer with or without '0' before the decimal point. As many as four decimal points, e.g. 12.5435 or 0.003 or -932.6711 or 12.82 can be entered.
 - c. To clear your answer, click on the Clear Response button
 - d. To save your answer, you **MUST** click on the **Save and Next** button
 - e. To mark a question for review, click on the **Mark for Review and Next** button. If an answer is selected (for MCQ) or entered (for numerical answer type) for a question that is Marked for Review, that answer will be considered in the evaluation.
7. To change your answer to a question that has already been answered, first select that question for answering and then follow the procedure for answering that type of question.
8. Note that **ONLY** Questions for which answers are saved or marked for review after answering will be considered for evaluation.

Paper Specific Instructions:

9. There are a total of 65 questions carrying 100 marks. Questions are of multiple choice type or numerical answer type. A multiple choice type question will have four choices for the answer with only one correct choice. For numerical answer type questions, the answer is a number and no choices will be given. A number as the answer should be entered using the virtual keyboard on the monitor.
10. Questions Q.1 – Q.10 belong to General Aptitude (GA) section and carry a total of 15 marks. Questions Q.1 – Q.5 carry 1mark each, and questions Q.6 – Q.10 carry 2marks each.
11. Questions Q.1 – Q.25 carry 1mark each. Questions Q.26 – Q.55 carry 2marks each.
12. Questions not attempted will result in zero mark. Wrong answers for multiple choice type questions will result in **NEGATIVE** marks. For all 1 mark questions, $\frac{1}{3}$ mark will be deducted for each wrong answer. For all 2 marks questions, $\frac{2}{3}$ mark will be deducted for each wrong answer. There is no negative marking for questions of numerical answer type.
13. Physical calculator is **NOT** allowed. All candidates will be provided with an online scientific calculator which has to be used to answer the questions.

Website: www.thegateacademy.com

Email: info@thegateacademy.com

To discuss this question paper visit www.thegateacademy.com. Navigate to the [Discussion Forum](#).

THE GATE ACADEMY PVT.LTD. H.O.: #74, KeshavaKrupa (third Floor), 30th Cross, 10th Main, Jayanagar 4th Block, Bangalore-11
☎: 080-617 66 222, ✉ info@thegateacademy.com © Copyright reserved. Web: www.thegateacademy.com

Test Series 4

Electrical Engineering

General Aptitude:

Q.1 - Q.5 Carry One Mark each.

- In the following question choose the word which is the exact OPPOSITE of the given words.
"QUIESCENT"
(A) Active (B) Dormant
(C) Weak (D) Unconcerned
- Which term of the series 5, 10, 20, 40, is 1280?
- A train normally covers a certain distance at a speed of 60 km/hr. However, if it were to halt for a fixed time interval in each hour, its average reduced to 50 km/hr. what is the time interval for which the train halts in each hour?
(A) 10 minutes (B) 20 minutes
(C) 6 minutes (D) 12 minutes
- Radha moves towards South-East a distance of 7 km, then she moves towards West and travels a distance of 14 km. From here she moves towards North-West a distance of 7 km and finally she moves a distance of 4 km towards east. How far is she now from the starting point?
- In the following question two statements are given and these statements are followed by two conclusions numbered (1) and (2). You have to take the given two statements to be true even if they seem to be at variance from commonly known facts. Read the conclusions and then decide which of the given conclusions logically follows from the two given statements, disregarding commonly known facts.
Statements: Some actors are singers. All the singers are dancers.
Conclusions:
 - Some actors are dancers.
 - No singer is actor.

(A) Only (1) conclusion follows (B) Only (2) conclusion follows
(C) Either (1) or (2) follows (D) Neither (1) nor (2) follows

Q.6 - Q.10 Carry Two Mark each.

- If Rupert has 4 more coins than Laxmi, Laxmi has 1 more coin than bill and bill has 1 more coin than Hawkins. Finally Hawkins has 4 more coins than Ajim. Then minimum number of coins that must be transferred, if all of them wish to have an equal number of coins:

7. The last digit of the expression $4 \times 9^2 \times 4^3 \times 9^4 \times 4^5 \times 9^6 \times \dots \times 4^{99} \times 9^{100}$ is:
(A) 4 (B) 6
(C) 9 (D) 1
8. The average age of boys in class is 16.66, while the average age of girls is 18.75. Thus average age of all the 40 students of the class is 17.5. If the difference between the number of boys and girls is 8, then the number of girls in the class is:
(A) 12 (B) 16
(C) 18 (D) Data insufficient
9. In an election only two candidates contested 20% of the voters did not vote and 120 votes were declared as invalid. The winner got 200 votes more than his opponents thus he secured 41% votes of the total voters on the voter list. Percentage votes of the defeated candidate out of the total votes casted is :
(A) 47.5% (B) 51.25%
(C) 36% (D) 45%
10. The amount of work in a leather factory is increased by 50%. By what percent is it necessary to increase the number of workers to complete the new amount of work in previously planned time, if the productivity of the new labour is 25% more.

Technical:

Q.1 - Q.25 Carry One Mark each.

1. Simplify the logic function

$$f(A, B, C, D) = \bar{A} + A\bar{C} + \bar{A}\bar{B}C + AB\bar{C}D + ABCD$$

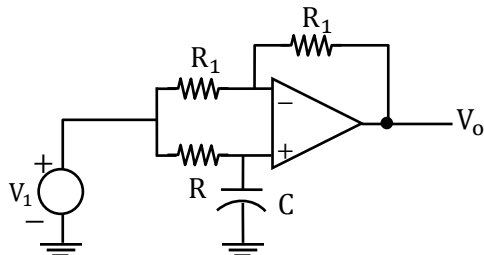
(A) $\bar{A} + \bar{A}C + \bar{A}\bar{B}C + A\bar{B}D$

(B) $\bar{A} + A\bar{C} + AB\bar{C} + AB\bar{D}$

(C) $A\bar{B} + \bar{A}C + B\bar{D} + ABCD$

(D) $\bar{A} + \bar{C} + BCD$

2. Below figure is a



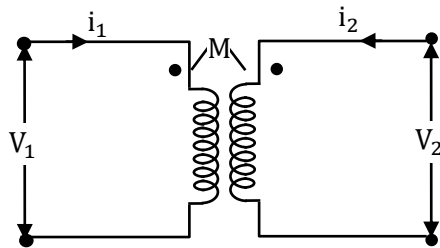
(A) Low pass filter

(B) High pass filter

(C) Band pass filter

(D) All pass filter

3. For the transformer shown below $L_1 = 25\text{mH}$, $L_2 = 100\text{mH}$



Assuming that two coils have same permeance, the ratio $\frac{N_2}{N_1}$ will be

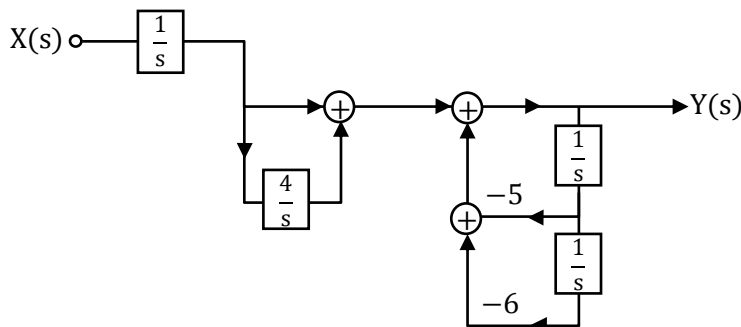
(A) 2

(B) 4

(C) 1/2

(D) 1/4

4. A system is represented by the below diagram using integrators $\frac{1}{s}$.



The transfer function of a system is $\frac{Y(s)}{X(s)}$. The response $y(t)$ for unit step input is:

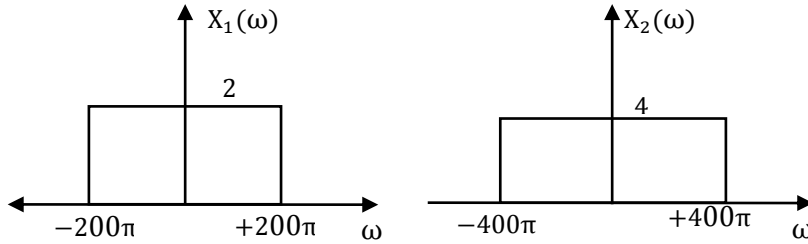
(A) $\left(\frac{1}{2} + \frac{1}{6}e^{-2t} - \frac{2}{3}e^{+3t}\right)u(t)$

(B) $\left(\frac{1}{6} + \frac{1}{2}e^{-3t} - \frac{2}{3}e^{-2t}\right)u(t)$

(C) $\left(\frac{1}{6} + \frac{1}{2}e^{-2t} - \frac{2}{3}e^{-3t}\right)u(t)$

(D) $\left(\frac{1}{3} + \frac{1}{6}e^{-3t} - \frac{2}{3}e^{-2t}\right)u(t)$

5. The Nyquist sampling rate for the signal $H(\omega) = X_1(\omega) * X_2(\omega)$ is _____ (in Hz)
Where



6. Find the particular solution for the given system of non-homogeneous linear equations

$$x_1 + 2x_2 + 2x_3 + 3x_4 = 4$$

$$2x_1 + 4x_2 + x_3 + 3x_4 = 5$$

$$3x_1 + 6x_2 + x_3 + 4x_4 = 7$$

(A) $\begin{pmatrix} 2 \\ 0 \\ 1 \\ 0 \end{pmatrix}$

(B) $\begin{pmatrix} -1 \\ 1 \\ 0 \\ 1 \end{pmatrix}$

(C) $\begin{pmatrix} 1 \\ 0 \\ 0 \\ 1 \end{pmatrix}$

(D) $\begin{pmatrix} 0 \\ 1 \\ 1 \\ 0 \end{pmatrix}$

7. The value of the contour integral $\oint_C \frac{\cosh 3z}{z^5}$ around the circle $|z| = 2$ in the counter clockwise direction is

(A) $\frac{27}{4}\pi i$

(B) $\frac{81}{4}\pi i$

(C) 0

(D) $\frac{9\pi i}{4}$

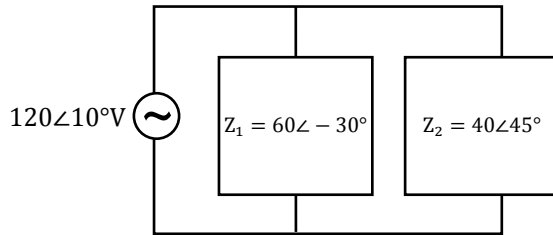
8. The value of integral:

$$H(\omega) = 9 \int_{-\infty}^{\infty} \left| \frac{\sin(\frac{\omega}{3})}{\omega} \right|^2 d\omega \text{ is } \underline{\hspace{2cm}}.$$

9. The absolute minima for the function $f(x) = x^2 \ln(x)$ occurs at _____ [Up to two decimal places]

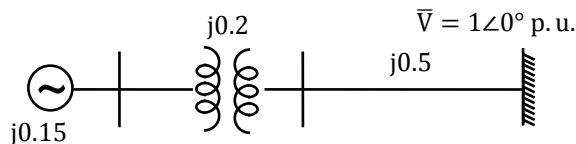
10. The Fourier transform of $f(t)$ is $F(\omega)$. If $F(\omega) = 25 \text{sinc} \left[\frac{5\omega}{\pi} \right] e^{+2j\omega}$ and $z(t) = f(-t - 2)$, then $z(t)$ at $t = -3$ is _____.

11. Total power absorbed by the circuit is _____ watts.

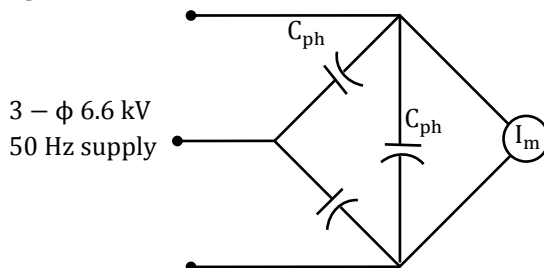


12. A series connected load draws a current $i(t) = 4 \cos(100\pi t + 10^\circ)$ A. When the applied voltage $v(t) = 120 \cos(100\pi t - 20^\circ)$ V. Apparent power and power factor is:
 (A) 240VA, 0.866(lagging) (B) 480VA, 0.866(lagging)
 (C) 240 VA, 0.866(leading) (D) 480VA, 0.866(leading)

13. An infinite machine shown in the figure has an inertia constant of 6 MW-s/MVA. It is supplying 0.8 p.u. of active power at 0.8 p.f lagging to the infinite bus of $1\angle 0^\circ$ p.u. voltage. All the p.u. reactances are marked on machine rating as base. The value of critical clearing angle(in radians) in case a solid three phase fault takes place at generator terminals is?(take $f=50$ Hz)

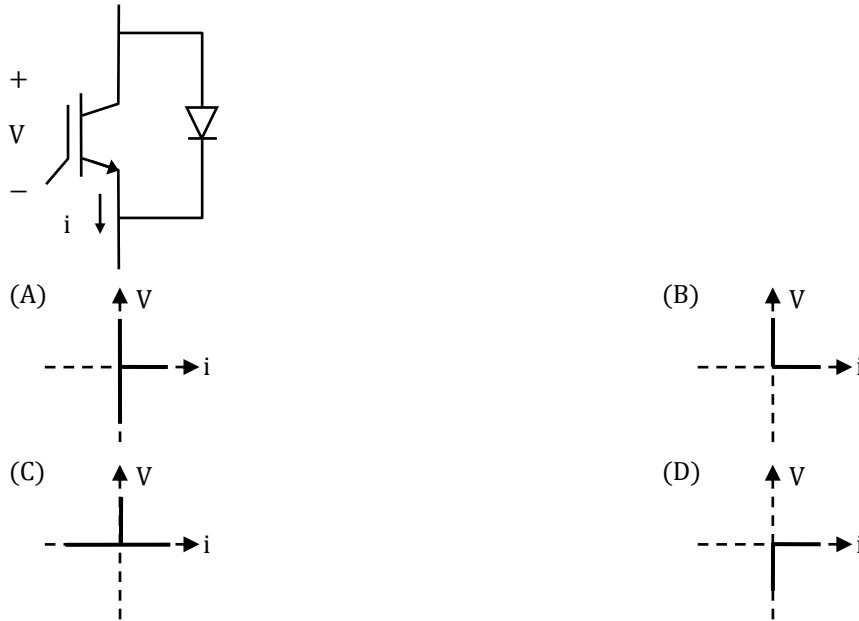


14. An 80kW; 6.6kv; 3-phase, star connected, wound rotor induction motor has a rated efficiency of 85% at 0.6 power factor lagging. What is the value of capacitor per phase C_{ph} (in μ F) connected in delta as shown in the figure to improve the power factor by 15%?

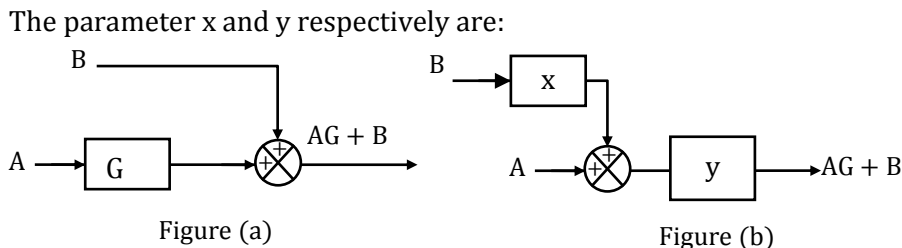


15. The most suitable compensation to neutralize Ferranti effect is?
 (A) Shunt capacitive (B) Series inductive
 (C) Shunt inductive (D) Series capacitive

20. The correct option corresponding to the power semiconductor module shown in figure is



21. The block diagram shown in figure (a) can be reduced as a block diagram as shown in figure (b)



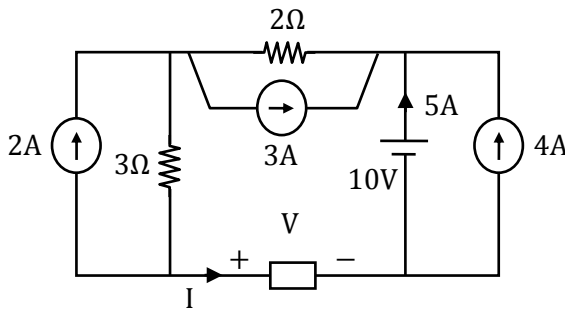
- The parameter x and y respectively are:
- (A) G, G
 - (B) $\frac{1}{G}, \frac{1}{G}$
 - (C) $\frac{1}{G}, G$
 - (D) $G, \frac{1}{G}$

22. A 1 ϕ , 220V, 50Hz, 4 pole capacitor start induction motor has the following stand still impedances:

Main winding: $Z_m = 8 + j4\Omega$
 Auxiliary winding: $Z_a = 8 + j5\Omega$

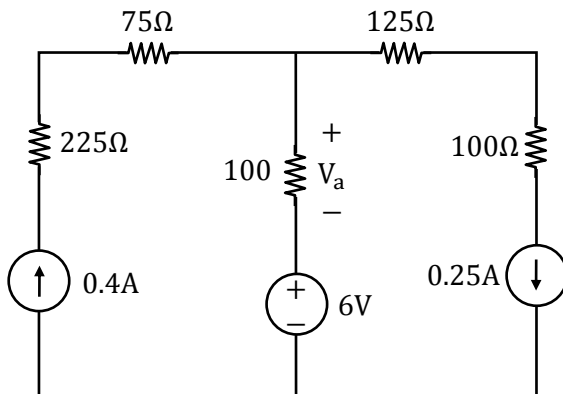
The value of starting capacitor required to produce 90° phase difference between the currents in the main and auxiliary winding will be _____ μ F

23. In the circuit given below,



The total power absorbed by the unknown element is _____ W.

24. For the circuit shown in figure the voltage V_o is



- (A) 20V
- (C) 15V

- (B) 21V
- (D) -15V

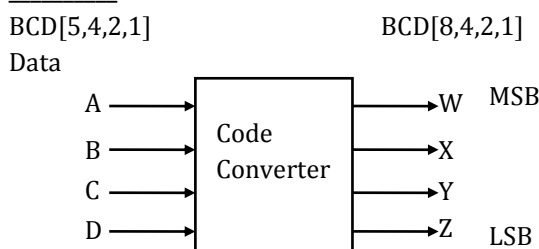
25. In cylindrical co-ordinates $\vec{A} = 100r^2\vec{a}_z$ Wb/m is a vector magnetic potential. The value of B (Web/m²) in this region is?

- (A) $-200r\vec{a}_\phi$
- (B) $200r\vec{a}_z$
- (C) $-200r\vec{a}_r$
- (D) $100r^2\vec{a}_\phi$

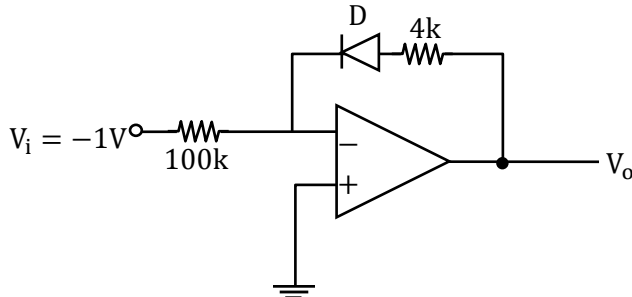
Q.26 - Q.55 Carry Two Mark each.

26. A code converter is to be designed to convert from BCD [5421] to normal BCD [8421]. The input BCD combinations for each digit are given below.

Minimum number of XOR gates are required to represent Z in terms of A, B, C, D are



27. Consider the following circuit using an ideal OPAMP. The I-V characteristics of the diode is described by the relation $I = I_0(e^{V/V_T} - 1)$ where $V_T = 25\text{mV}$, $I_0 = 1\mu\text{A}$ and V is the voltage across the diode(taken as positive for forward bias)



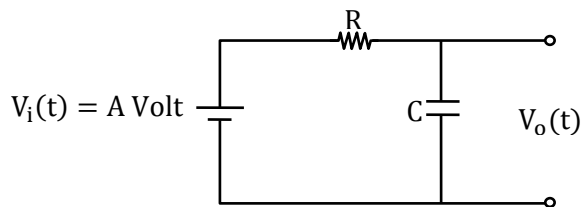
For an input voltage $V_i = -1\text{ V}$, the output voltage V_o is

- (A) 0 V (B) 0.1V
(C) 0.7 V (D) 1.1 V
28. A sinusoidal signal $x(t) = 3 \sin(8000\pi t)$ is sampled at a sampling rate of 6000 samples/sec and reconstructed with an ideal LPF $H(f)$.

$$H(f) = \begin{cases} \frac{1}{5000} & |f| \leq 3000\text{Hz} \\ 0 & \text{Otherwise} \end{cases}$$

The spectrum of reconstructed signal will have frequency component of:

- (A) 4 kHz only
(B) 2 kHz only
(C) 2 kHz and 4 kHz
(D) 2 kHz, 4 kHz and 6 kHz
29. The Fourier transform of a signal $F(t)$ is $F(\omega) = \frac{5}{\omega} \cos 3\omega \cdot \sin 5\omega$. The area under time $\int_{-\infty}^{\infty} F(t) \cdot dt$ is equal to A. If A volt is applied as input to the below circuit.



$R = 10\text{ k}\Omega$
 $C = 100\text{ }\mu\text{F}$

The transfer functions of above system $\frac{V_o(s)}{V_i(s)}$. The value of output (Volt) is:

- (A) $(25 - 25e^{-t})u(t)$ (B) $(25 + 25e^{+t})u(t)$
(C) $(5 - 5e^{-t})u(t)$ (D) $(25 - 25e^{-2t})$

30. Calculate

$$\int_C \frac{2z + 3}{z} dz$$

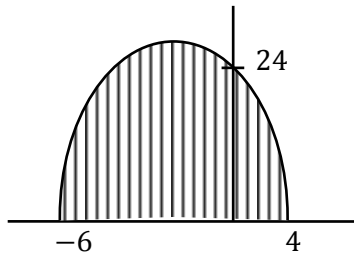
Where C is lower half of circle $|z| = 2$

- (A) $8 + 2\pi i$ (B) 0
(C) $3 + 8\pi i$ (D) $8 + 3\pi i$

31. The determinant of the matrix

$$\begin{bmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{bmatrix} \text{ is } \underline{\hspace{2cm}}$$

32. For the shaded region given below, what is its area? (**Hint:** Given Curve is a parabola)

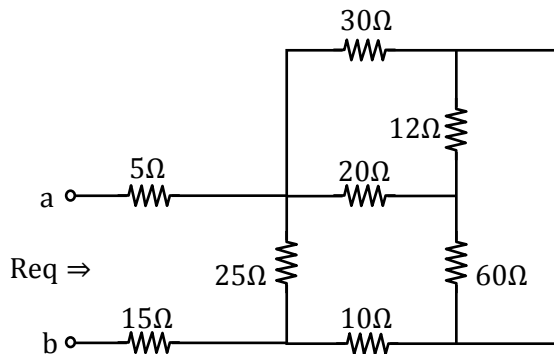


33. Using Cauchy's Integral formula .Find the value of

$$\oint_C \frac{\sin z}{z^2 - 2iz} dz, \quad C: |z| = 3 \text{ (Counter clockwise)}$$

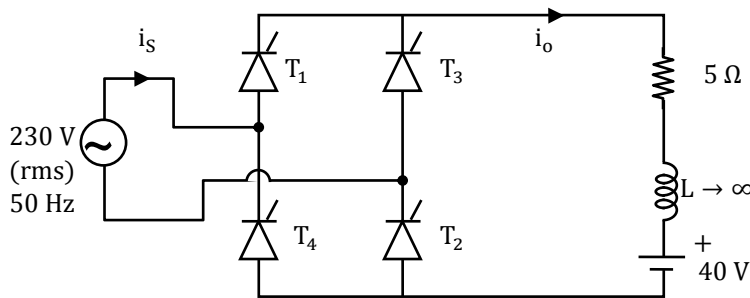
- (A) $\frac{\pi}{2}i(e^2 + e^{-2})$ (B) $\frac{\pi}{2}i(e^{-2} - e^{+2})$
(C) $\frac{\pi}{2}i(e^2 - e^{-2})$ (D) $\frac{\pi}{2}i(-e^{+2} - e^{-2})$

34. Equivalent resistance across a – b is _____ Ω .

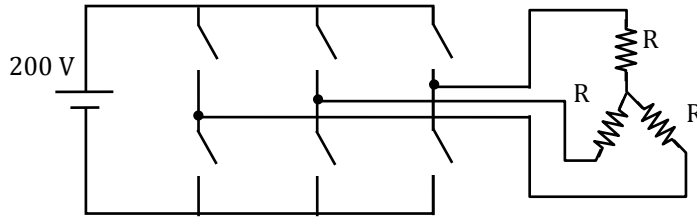


35. The h-parameter for a certain two port network is given by $\begin{bmatrix} 9\Omega & -2 \\ 20 & 0.2S \end{bmatrix}$. If 1Ω resistor is connected in series with the output then the new value of h_{21} is _____ [up to two decimals]

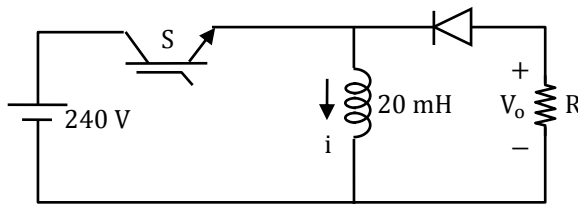
40. A generator rated at 100 MVA 11kV is supplying full load at 0.7 pf. lagging to an electrical load. The initial accelerating torque (in kNm) in case of solid three phase fault at generator terminals is? (Take $f=50$ Hz ; $P=4$).
41. A 3 ϕ single motor is driving a constant torque load of 1 pu at 5% slip. It has a maximum torque of 2 pu at 10% slip. Torque speed variation in stable zone is assumed to be linear. For stable operation of the motor , the minimum pu supply voltage is
 (A) 0.25 pu (B) 0.50 pu
 (C) 0.707 pu (D) 0.80 pu
42. A 100 kVA,11kV/400 V, 3 ϕ transformer has its maximum possible efficiency of 98% when it delivers 80 kVA at unity power factor and rated voltage .The efficiency at the kVA output, of the transformer at 0.8 power factor lagging is
 (A) 97.45% (B) 99%
 (C) 98.5% (D) 96.3%
43. A 3 ϕ , 4pole star connected squirrel cage induction motor with rated condition as , 400 V, 50 HZ,1380 rpm. This motor in a constant V/f control develops 23.5 Nm rated full load torque at 50 HZ. Find the frequency at which it produces the same full load torque of 23.5 Nm at a speed of 1000 rpm. The rotor resistance , $r'_2 = 3\Omega$
 (A) 55 Hz (B) 60 Hz
 (C) 46.7 Hz (D) 36.7 Hz
44. A 5kVA, 200V/100 V, 50 Hz single phase ideal two winding transformer is to be used as an auto transformer of 200V/300 V. Calculate the maximum kVA achieved by this auto transformer without overloading HV and LV windings . Also calculate the kVA transferred magnetically and electrically respectively
 (A) 30 kVA,5 kVA, 25 kVA (B) 15 kVA,5 kVA,10 kVA
 (C) 20 kVA, 5kVA,15 kVA (D) 35 kVA,15 kVA,20 kVA
45. The thyristors in the bridge converter are triggered at 30°.The rms value of current flowing through each thyristor is? (in Amp)



46. The inverter shown operates in 180° conduction mode. If $R = 15\Omega$ then power delivered to load in kW is?



47. The IGBT 'S' operates at a duty ratio of 40% with a switching frequency of 2 kHz. The peak to peak ripple current in the inductor (in Amp) is?

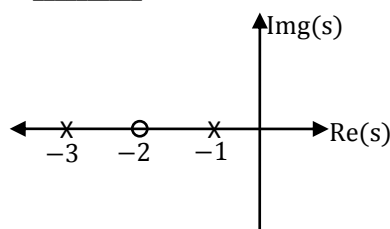


- (A) 1.2 (B) 2.4
(C) 3.6 (D) 4.8
48. If the commutation angle (over lapping angle) of a diode rectifier due to source inductance is μ , then inductive voltage regulation is ?

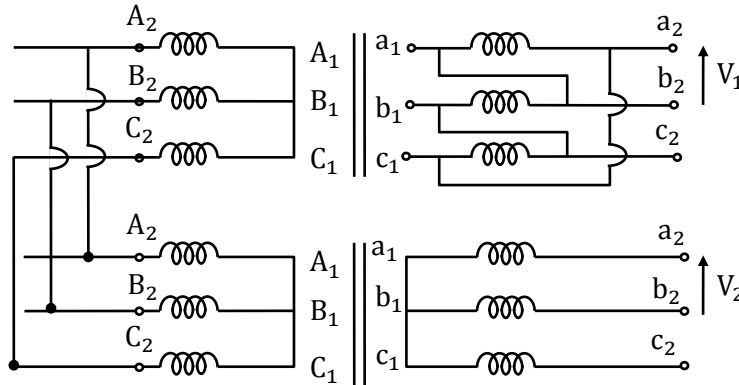
(A) $\frac{1 + \cos \mu}{2}$ (B) $1 + \frac{\cos \mu}{2}$
(C) $1 - \frac{\cos \mu}{2}$ (D) $\frac{1 - \cos \mu}{2}$

49. The state equation of a system $\dot{X} = \begin{pmatrix} 0 & 1 \\ -20 & -9 \end{pmatrix} X + \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ the poles of this system are located at
(A) 4,5 (B) 1,20
(C) -4,-5 (D) 9,20

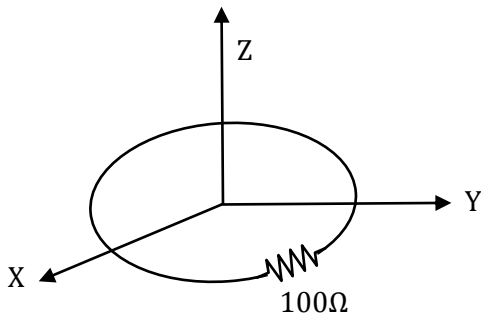
50. The pole zero diagram of an LTI system $G(s)$ is shown below. The steady state value of output for unit step input is 2. The impulse response of the same system $y(t)$ at $t = 0.1$ sec is _____



51. Two 3 ϕ transformers are realized using single phase transformer as shown below. The phase difference between voltage V_1 and V_2 is



- (A) V_2 lags V_1 by 30° (B) V_2 leads V_1 by 30°
 (C) V_2 lags V_1 by 60° (D) V_2 leads V_1 by 60°
52. An amplifier has an input power of 2 micro watts. The power gain of the amplifier is 60dB. The output power will be
 (A) 6 microwatts (B) 120 microwatts
 (C) 2 milliwatts (D) 2 watts
53. The surge impedance loading of a power system is 2000 MW. A shunt capacitive compensation of 25% is emplaced. The new surge impedance loading (in MW) is _____.
54. An energy meter is connected to an immersion heater (Resistive) supplied with 200V peak to peak square wave, then it reads 3 units. If square wave is removed and a saw tooth wave of peak value 100V is applied then the power dissipated by the heater is _____
Note: Assume meter is operated for 2 hrs
 (A) 1000 W (B) 500 W
 (C) 1500 W (D) 2000 W
55. The circular loop shown in the xy plane has a radius of 0.2m. The loop consists of a resistance of 100Ω as shown in the figure. If the magnetic flux density is $\vec{B} = 0.6\sin 10^3 t \vec{a}_z$ T, the current flowing through the loop is:



- (A) $0.754 \sin 10^3 t$ A (B) $-0.754 \cos 10^3 t$ A
 (C) $-0.754 \sin 10^3 t$ A (D) $0.754 \cos 10^3 t$ A