

EE - GATE 2014 - Paper

EE PAPER NO. 1

Q. No. 1 – 5 Carry One Mark Each

G. A. Questions

- Which of the following options is the closest in meaning to the phrase underlined in the sentence below?
It is fascinating to see life forms cope with varied environmental conditions.
(A) Adopt to (B) Adapt to (C) Adept in (D) Accept with
- Choose the most appropriate word from the options given below to complete the following sentence.
He could not understand the judges awarding her the first prize, because he thought that her performance was quite _____.
(A) Superb (B) Medium (C) Mediocre (D) Exhilarating
- In a press meet on the recent scam, the minister said, "The buck stops here". What did the minister convey by the statement?
(A) He wants all the money (B) He will return the money
(C) He will assume final responsibility (D) He will resist all enquiries
- If $(z + 1/z)^2 = 98$, compute $(z^2 + 1/z^2)$
- The roots of $ax^2 + bx + c = 0$ are real and positive a, b and c are real. Then $ax^2 + b|x| + c = 0$ has
(A) No roots (B) 2 real roots (C) 3 real roots (D) 4 real roots

Q. No. 6 – 10 Carry One Mark Each

- The Palghat Gap (or Palakkad Gap), a region about 30 km wide in the southern part of the Western Ghats in India, is lower than the hilly terrain to its north and south. The exact reasons for the formation of this gap are not clear. It results in the neighbouring regions of Tamil Nadu getting more rainfall from the South West monsoon and the neighbouring regions of Kerala having higher summer temperatures.
What can be inferred from this passage?
(A) The Palghat gap is caused by high rainfall and high temperatures in southern Tamil Nadu and Kerala
(B) The regions in Tamil Nadu and Kerala that are near the Palghat Gap are low-lying
(C) The low terrain of the Palghat Gap has a significant impact on weather patterns in neighbouring parts of Tamil Nadu and Kerala
(D) Higher summer temperatures result in higher rainfall near the Palghat Gap area
- Geneticists say that they are very close to confirming the genetic roots of psychiatric illnesses such as depression and schizophrenia, and consequently, that doctors will be able to eradicate these diseases through early identification and gene therapy.
On which of the following assumptions does the statement above rely?
(A) Strategies are now available for eliminating psychiatric illnesses
(B) Certain psychiatric illnesses have a genetic basis
(C) All human diseases can be traced back to genes and how they are expressed
(D) In the future, genetics will become the only relevant field for identifying psychiatric illnesses

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8. Round-trip tickets to a tourist destination are eligible for a discount of 10% on the total fare. In addition, groups of 4 or more get a discount of 5% on the total fare. If the one way single person fare is Rs 100, a group of 5 tourists purchasing round-trip tickets will be charged Rs _____

9. In a survey, 300 respondents were asked whether they own a vehicle or not. If yes, they were further asked to mention whether they own a car or scooter or both. Their responses are tabulated below. What percent of respondents do not own a scooter?

		Men	Women
Own vehicle	Car	40	34
	Scooter	30	20
	Both	60	46
Do not own vehicle		20	50

10. When a point inside of a tetrahedron (a solid with four triangular surfaces) is connected by straight lines to its corners, how many (new) internal planes are created with these lines?

Electrical Engineering

Q. No. 1 – 25 Carry One Mark Each

1. Given a system of equations:

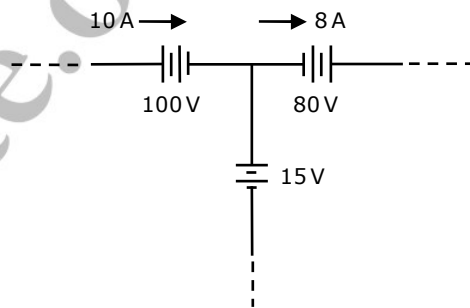
$$x + 2y + 2z = b_1$$

$$5x + y + 3z = b_2$$

Which of the following is true regarding its solutions?

- (A) The system has a unique solution for any given b_1 and b_2
(B) The system will have infinitely many solutions for any given b_1 and b_2
(C) Whether or not a solution exists depends on the given b_1 and b_2
(D) The system would have no solution for any values of b_1 and b_2
2. Let $f(x) = x e^{-x}$. The maximum value of the function in the interval $(0, \infty)$ is
(A) e^{-1} (B) e (C) $1 - e^{-1}$ (D) $1 + e^{-1}$

3. The solution for the differential equation $\frac{d^2x}{dt^2} = -9x$ with initial conditions $x(0) = 1$ and $\left. \frac{dx}{dt} \right|_{t=0} = 1$, is
- (A) $t^2 + t + 1$ (B) $\sin 3t + \frac{1}{3} \cos 3t + \frac{2}{3}$
- (C) $\frac{1}{3} \sin 3t + \cos 3t$ (D) $\cos 3t + t$
4. Let $X(s) = \frac{3s+5}{s^2+10s+21}$ be the Laplace Transform of a signal $x(t)$. Then, $x(0^+)$ is
- (A) 0 (B) 3 (C) 5 (D) 21
5. Let S be the set of points in the complex plane corresponding to the unit circle. (That is, $S = \{z : |z| = 1\}$). Consider the function $f(z) = zz^*$ where z^* denotes the complex conjugate of z . The $f(z)$ maps S to which one of the following in the complex plane
- (A) Unit circle
 (B) Horizontal axis line segment from origin to (1, 0)
 (C) The point (1, 0)
 (D) The entire horizontal axis
6. The three circuit elements shown in the figure are part of an electric circuit. The total power absorbed by the three circuit elements in watts is _____

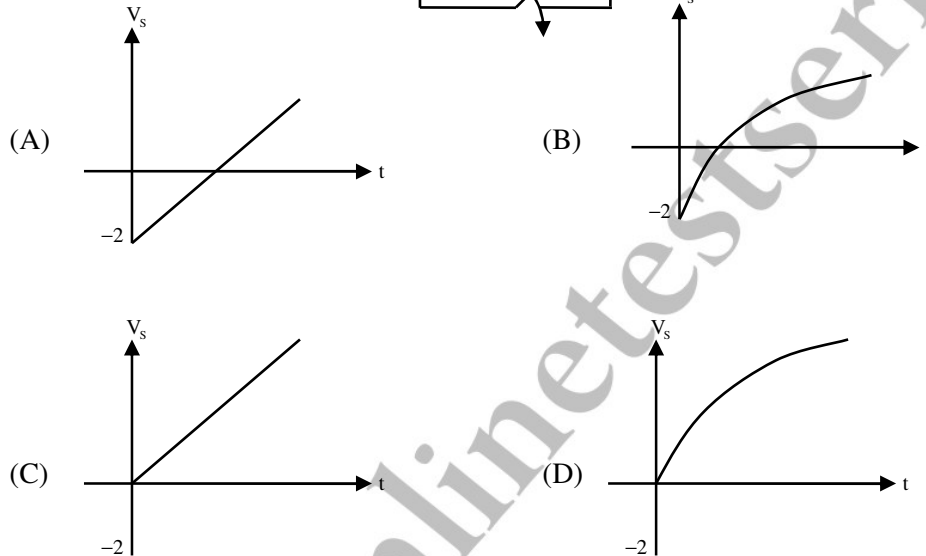
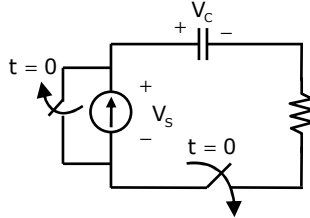


7. C_0 is the capacitance of a parallel plate capacitor with air as dielectric (as in figure (a)). If, half of the entire gap as shown in figure (b) is filled with a dielectric of permittivity ϵ_r , the expression for the modified capacitance is



- (A) $\frac{C_0}{2}(1+\epsilon_r)$ (B) $(C_0+\epsilon_r)$ (C) $\frac{C_0}{2}\epsilon_r$ (D) $C_0(1+\epsilon_r)$

8. A combination of $1\mu\text{F}$ capacitor with an initial voltage $v_c(0) = -2\text{V}$ in series with a 100Ω resistor is connected to a 20mA ideal dc current source by operating both switches at $t = 0\text{s}$ as shown. Which of the following graphs shown in the options approximates the voltage v_s across the current source over the next few seconds?

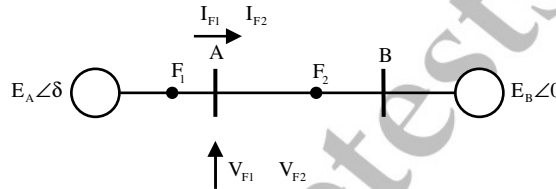


9. $x(t)$ is nonzero only for $T_x < t < T'_x$, and similarly, $y(t)$ is nonzero only for $T_y < t < T'_y$. Let $z(t)$ be convolution of $x(t)$ and $y(t)$. Which one of the following statements is TRUE?
- (A) $z(t)$ can be nonzero over an unbounded interval
 (B) $z(t)$ is nonzero for $t < T_x + T_y$
 (C) $z(t)$ is zero outside of $T_x + T_y < t < T'_x + T'_y$
 (D) $z(t)$ is nonzero for $t > T'_x + T'_y$
10. For a periodic square wave, which one of the following statements is TRUE?
- (A) The Fourier series coefficients do not exist
 (B) The Fourier series coefficients exist but the reconstruction converges at no point
 (C) The Fourier series coefficients exist and the reconstruction converges at most points.
 (D) The Fourier series coefficients exist and the reconstruction converges at every point
11. An 8-pole, 3-phase, 50 Hz induction motor is operating at a speed of 700 rpm. The frequency of the rotor current of the motor in Hz is _____
12. For a specified input voltage and frequency, if the equivalent radius of the core of a transformer is reduced by half, the factor by which the number of turns in the primary should change to maintain the same no load current is _____

13. A star connected 400V, 50Hz, 4 pole synchronous machine gave the following open circuit and short circuit test results:
 Open circuit test: $V_{oc} = 400V$ (rms, line-to-line) at field current, $I_f = 2.3A$
 Short circuit test: $I_{sc} = 10A$ (rms, phase) at field current, $I_f = 1.5A$
 The value of per phase synchronous impedance in Ω at rated voltage is _____

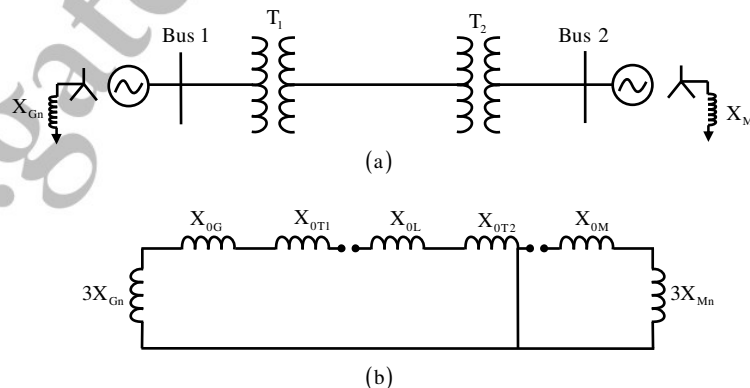
14. The undesirable property of an electrical insulating material is
 (A) High dielectric strength (B) High relative permittivity
 (C) High thermal conductivity (D) High insulation resistivity

15. Three-phase to ground fault takes place at locations F_1 and F_2 in the system shown in the figure



If the fault takes place at location F_1 , then the voltage and the current at bus A are V_{F1} and I_{F1} respectively. If the fault takes place at location F_2 , then the voltage and the current at bus A are V_{F2} and I_{F2} respectively. The correct statement about voltages and currents during faults at F_1 and F_2 is

- (A) V_{F1} leads I_{F1} and V_{F2} leads I_{F2} (B) V_{F1} leads I_{F1} and V_{F2} lags I_{F2}
 (C) V_{F1} lags I_{F1} and V_{F2} leads I_{F2} (D) V_{F1} lags I_{F1} and V_{F2} lags I_{F2}
16. A 2-bus system and corresponding zero sequence network are shown in the figure.

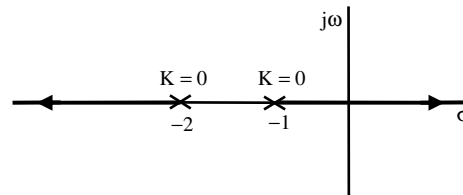


The transformers T_1 and T_2 are connected as

- (A) $\Delta \Delta$ and $\Delta \Delta$ (B) $\Delta \Delta$ and $\Delta \Delta$
 (C) $\Delta \Delta$ and $\Delta \Delta$ (D) $\Delta \Delta$ and $\Delta \Delta$

17. In the formation of Routh–Hurwitz array for a polynomial, all the elements of a row have zero values. This premature termination of the array indicates the presence of
- (A) Only one root at the origin (B) Imaginary roots
 (C) Only positive real roots (D) Only negative real roots

18. The root locus of a unity feedback system is shown in the figure



The closed loop transfer function of the system is

- (A) $\frac{C(s)}{R(s)} = \frac{K}{(s+1)(s+2)}$ (B) $\frac{C(s)}{R(s)} = \frac{-K}{(s+1)(s+2)+K}$
 (C) $\frac{C(s)}{R(s)} = \frac{K}{(s+1)(s+2)-K}$ (D) $\frac{C(s)}{R(s)} = \frac{K}{(s+1)(s+2)+K}$
19. Power consumed by a balanced 3–phase, 3–wire load is measured by the two wattmeter method. The first wattmeter reads twice that of the second. Then the load impedance angle in radians is
- (A) $\frac{\pi}{12}$ (B) $\frac{\pi}{8}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{3}$
20. In an oscilloscope screen, linear sweep is applied at the
- (A) Vertical axis (B) Horizontal axis
 (C) Origin (D) Both horizontal and vertical axis
21. A cascade of three identical modulo–5 counters has an overall modulus of
- (A) 5 (B) 25 (C) 125 (D) 625
22. In the Wien Bridge oscillator circuit shown in figure, the bridge is balanced when

