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GATE ASSIGNMENT

AI25BTECH11015 - M Sai Rithik

GATE 2014 ELECTRICAL ENGINEERING

Q.1 – Q.5 carry one mark each

Q1: Which of the following options is 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

Q2: 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

Q3: 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

Q4: If $(z + \frac{1}{z})^2 = 98$, compute $z^2 + \frac{1}{z^2}$.

_____

Q5: The roots of $ax^2 + bx + c = 0$ are real and positive. a, b, 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.6 – Q.10 carry two marks each

Q6: 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

Q7: 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

Q8: 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 _____.

Q9: 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.

	Men	Women	Total
Own Car	40	34	74
Own Scooter	30	20	50
Own Both	60	46	106
Do not own vehicle	20	50	70
Total	150	150	300

What percent of respondents do not own a scooter?

_____

Q10: 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?

_____

GATE 2014 EE SET 1

Q10: 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.

Q11: 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 _____.

Q12: 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

(A) 1/4

(B) 1/2

(C) 2

(D) 4

Q13: A star connected 400 V, 50 Hz, 4 pole synchronous machine gave the following open circuit and short circuit test results:
Open circuit test: $V_{oc} = 400$ V (rms, line-to-line) at field current $I_f = 2.3$ A
Short circuit test: $I_{sc} = 10$ A (rms, phase) at field current $I_f = 1.5$ A
The value of per phase synchronous impedance in Ω at rated voltage is _____.

Q14: 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

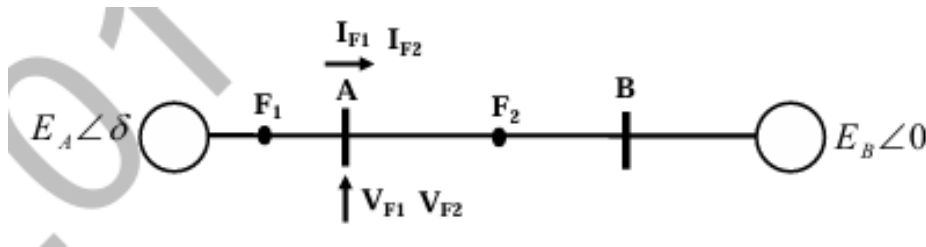Q15: Three-phase to ground fault takes place at locations F_1 and F_2 in the system shown in the figure.

Fig. 1. Three-phase system with faults at F_1 and F_2.

If the fault takes place at location F_1, 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 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}

Q16: 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) YN YN and Δ

(B) Y$_\Delta$ and Δ

(C) Y_Δ and Δ YN

(D) Δ and Y_Δ

Q17: 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

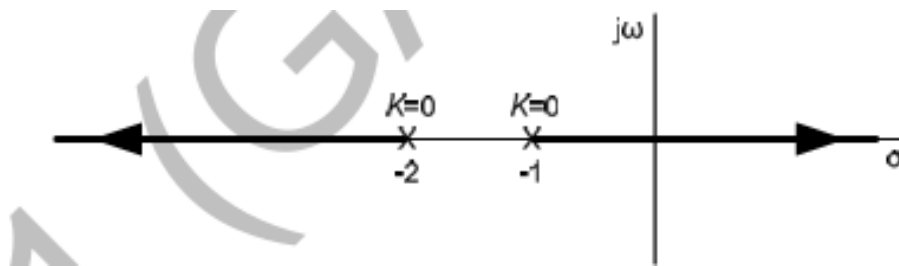Q18: The root locus of a unity feedback system is shown below:

Fig. 2. Root locus plot for a unity feedback system.

The closed loop transfer function of the system is

(A) $\dfrac{C(s)}{R(s)} = \dfrac{K}{(s+1)(s+2)}$

(B) $\dfrac{C(s)}{R(s)} = \dfrac{-K}{(s+1)(s+2)+K}$

(C) $\dfrac{C(s)}{R(s)} = \dfrac{K}{(s+1)(s+2)-K}$

(D) $\dfrac{C(s)}{R(s)} = \dfrac{K}{(s+1)(s+2)+K}$

Q19: Power consumed by a balanced three-phase, three-wire load is measured by the two wattmeter method. The first wattmeter reads twice that of the second. The load impedance angle in radians is

(A) $\pi/12$

(B) $\pi/8$

(C) $\pi/6$

(D) $\pi/3$

Q20: In an oscilloscope screen, linear sweep is applied at the

(A) vertical axis

(B) horizontal axis

(C) origin

(D) both horizontal and vertical axis

Q31: In an unbalanced three phase system, phase current $I_a = 1\angle(-90°)$ pu, negative sequence current $I_{b2} = 4\angle(-150°)$ pu, zero sequence current $I_{c0} = 3\angle90°$ pu. The magnitude of phase current I_b in pu is

(A) 1.00

(B) 7.81

(C) 11.53

(D) 13.00

Q32: The following four vector fields are given in Cartesian coordinates. The vector field which does not satisfy the property of magnetic flux density is

(A) $y^2\mathbf{a}_x + z^2\mathbf{a}_y + x^2\mathbf{a}_z$

(B) $z^2\mathbf{a}_x + x^2\mathbf{a}_y + y^2\mathbf{a}_z$

(C) $x^2\mathbf{a}_x + y^2\mathbf{a}_y + z^2\mathbf{a}_z$

(D) $y^2z^2\mathbf{a}_x + x^2z^2\mathbf{a}_y + x^2y^2\mathbf{a}_z$

Q33: The function shown in the figure can be represented as
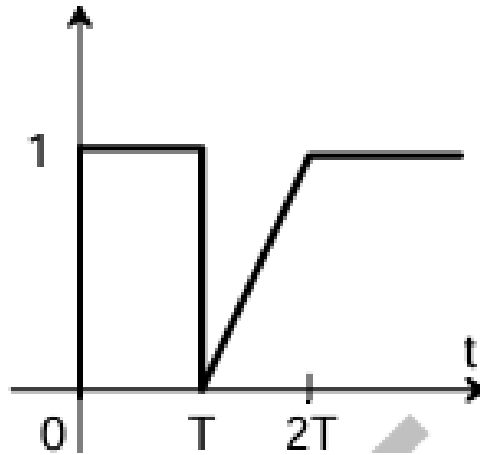
(A) $u(t) - u(t-T) + \frac{t-T}{T}u(t-T) - \frac{t-2T}{T}u(t-2T)$

(B) $u(t) + \frac{t}{T}u(t-T) - \frac{t}{T}u(t-2T)$

(C) $u(t) - u(t-T) + \frac{t-T}{T}u(t-T) - \frac{t-2T}{T}u(t)$

(D) $u(t) + \frac{t-T}{T}u(t-T) - \frac{t-2T}{T}u(t-2T)$

Q34: Let $X(z) = \frac{1}{1-z^{-3}}$ be the Z-transform of a causal signal $x[n]$. Then, the values of $x[2]$ and $x[3]$ are

(A) 0 and 0

(B) 0 and 1

(C) 1 and 0

(D) 1 and 1

Q35: Let $f(t)$ be a continuous time signal and let $F(\omega)$ be its Fourier transform defined by

$$F(\omega) = \int_{-\infty}^{\infty} f(t)e^{-j\omega t}dt$$

Define $g(t)$ by

$$g(t) = \int_{-\infty}^{\infty} F(u)e^{-jut}du$$

What is the relationship between $f(t)$ and $g(t)$?

(A) $g(t)$ would always be proportional to $f(t)$

(B) $g(t)$ would be proportional to $f(t)$ if $f(t)$ is even

(C) $g(t)$ would be proportional to $f(t)$ only if $f(t)$ is sinusoidal

(D) $g(t)$ would never be proportional to $f(t)$

Q25: Figure shows four electronic switches (i)-(iv). Which can block voltages of either polarity (applied between terminals 'a' and 'b') when the active device is OFF?
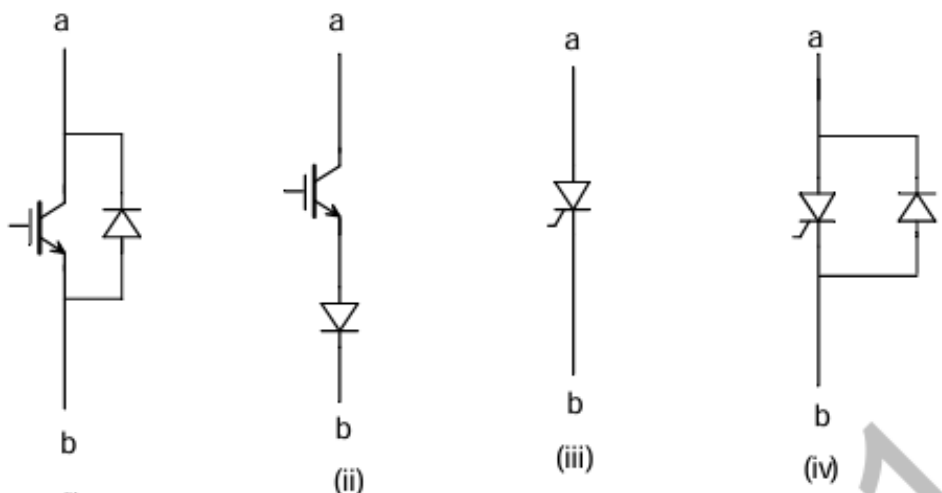
(A) (i), (ii) and (iii)

(B) (ii), (iii) and (iv)

(C) (ii) and (iii)

(D) (i) and (iv)

Q26: Let $g : [0, \infty) \to [0, \infty)$, $g(x) = x - [x]$, where $[x]$ is the greatest integer less than or equal to x. The value of the constant term in the Fourier series expansion for $g(x)$ is

_____.

Q27: A fair coin is tossed n times. The probability that the difference between the number of heads and tails is $(n - 3)$ is

(A) 2^{-n}

(B) 0

(C) $\binom{n}{(n-3)/2}2^{-n}$

(D) $2^{-(n+3)}$

Q28: The line integral of $F = yz\mathbf{i}$ in the counterclockwise direction, along the circle $x^2 + y^2 = 1$, at $z = 1$ is

(A) -2π

(B) $-\pi$

(C) π

(D) 2π

Q29: An incandescent lamp is marked 40 W, 240 V. If resistance at room temperature (26°C) is 120 Ω and temperature coefficient of resistance is $4.5 \times 10^{-3}/$ °C, then its 'ON' state filament temperature °C is approximately _____.

Q30: In the figure, the value of resistor R is $(25 + I/2)$ ohms, where I is the current in amperes. The current I is
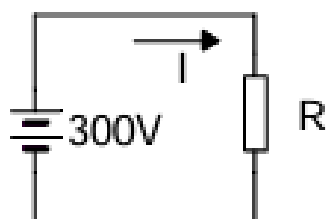

Q40: A distribution feeder of 1 km length having resistance but negligible reactance is fed from both ends by 400 V, 50 Hz balanced sources. Both sources S_1, S_2 are in phase. The feeder supplies concentrated loads of unity power factor as shown in figure.
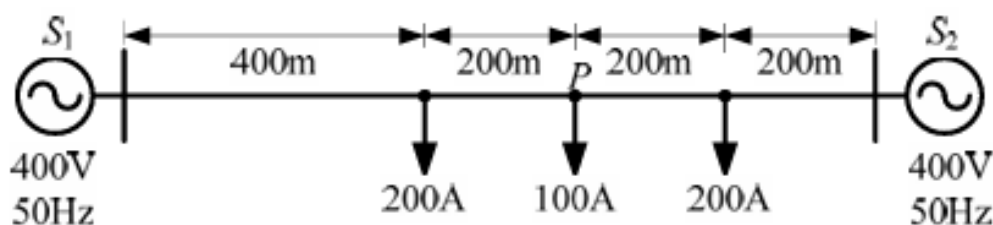
The contributions of S_1 and S_2 in 100 A current supplied at location P respectively, are

(A) 75 A and 25 A

(B) 50 A and 50 A

(C) 25 A and 75 A

(D) 0 A and 100 A

Q41: A two bus power system shown in the figure supplies load of $1.0 + j0.5$ p.u.
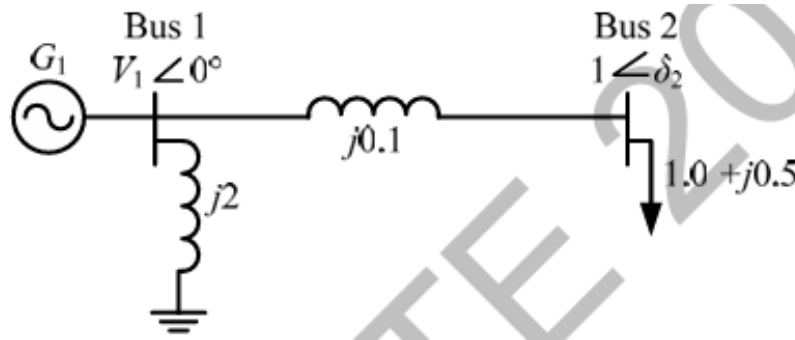
The values of V_1 in p.u. and δ_2 respectively are

(A) 0.95 and $6.00°$

(B) 1.05 and $-5.44°$

(C) 1.1 and $-6.00°$

(D) 1.1 and $-27.12°$

Q42: The fuel cost functions of two power plants are: Plant $P_1 : C_1 = 0.05 P_{g1}^2 + A P_{g1} + B$
Plant $P_2 : C_2 = 0.10 P_{g2}^2 + 3A P_{g2} + 2B$
If the two plants optimally share 1000 MW load at incremental fuel cost of 100 Rs/MWh, the ratio of load shared by P_1 and P_2 is:

(A) 1:4

(B) 2:3

(C) 3:2

(D) 4:1

Q43: The overcurrent relays for the line protection and loads connected at buses are shown.
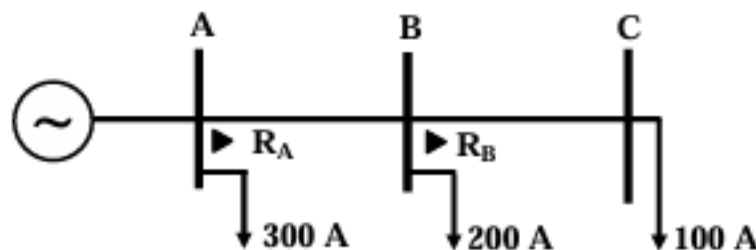
The relays are IDMT in nature with characteristic:

$$t_{op} = \frac{0.14 \times \text{TimeMultiplierSetting}}{(\text{PlugSettingMultiplier})^{0.02} - 1}$$

The maximum and minimum fault currents at bus B are 2000 A and 500 A. Assuming the time multiplier setting and plug setting for relay R_B to be 0.1 and 5A respectively, the operating time of R_B (in seconds) is _____.

Q36: The core loss of a single phase, 230/115 V, 50 Hz power transformer is measured from 230 V side by feeding the primary (230 V side) from a variable voltage–variable

frequency source while keeping the secondary open circuited. The core loss is measured to be 1050 W for 230 V, 50 Hz input, and again 500 W for 138 V, 30 Hz input. The hysteresis and eddy current losses at 230 V, 50 Hz input are:

(A) 508 W and 542 W

(B) 468 W and 582 W

(C) 498 W and 552 W

(D) 488 W and 562 W

Q37: A 15 kW, 230 V dc shunt motor has armature resistance 0.4 Ω and field resistance 230 Ω. At no load and rated voltage, the motor runs at 1400 rpm, and the line current is 5 A. At full load, it draws 70 A. Neglect armature reaction. The full load speed of the motor, in rpm: _____

Q38: A 3-phase, 50 Hz, six pole induction motor has rotor resistance 0.1 Ω and reactance 0.92 Ω. Neglect stator voltage drop and assume constant rotor resistance. For full load slip 3%, the ratio of maximum torque to full load torque is:

(A) 1.567

(B) 1.712

(C) 1.948

(D) 2.134

Q39: A three-phase synchronous generator is to be connected to the infinite bus. The lamps are connected for synchronization as shown (figure). The phase sequence of bus voltage is R-Y-B and that of incoming generator voltage is R'-Y'-B'. It was found that the lamps darken in sequence L_a-L_b-L_c. The phase sequence of incoming generator is:

(A) opposite to infinite bus and its frequency is more than infinite bus

(B) opposite to infinite bus but its frequency is less than infinite bus

(C) same as infinite bus and its frequency is more than infinite bus

(D) same as infinite bus and its frequency is less than infinite bus