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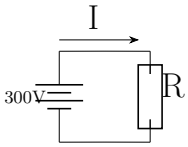
1 SECTION-A

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

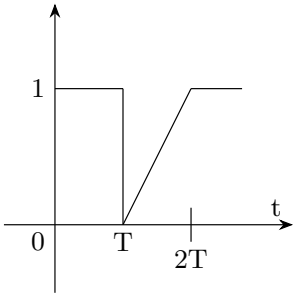


2) In an unbalanced three phase system, phase current $I_\alpha = 1\angle(-90°)$ pu, negative sequence current $I_(b_2) = 4\angle(150_\circ)$ pu, zero sequence current $I_c0 = 3\angle90_\circ$ pu. The magnitude of phase current I_b in pu is

a) 1.00 b) 7.81 c) 11.53 d) 13.00

3) The following four vector fields are given in Cartesian co-ordinate system. The vector field which does not satisfy the property of magnetic flux density is
   a) $y^2a_x + z^2a_x + x^2a_z$
   b) $z^2a_x + x^2a_y + y^2a_z$
   c) $x^2a_x + y^2a_y + z^2a_z$
   d) $y^2z^2a_x + x^2z^2a_y + x^2y^2a_z$

4) The function shown in the figure can be represented as



   a) $u(t) - u(t-T) + \frac{t-T}{T}u(t-T) - \frac{tu-2T}{T}u(t-2T)$
   b) $u(t) + \frac{t}{T}u(t-T) - \frac{t}{T}ut - 2T$
   c) $u(t) - u(t-T) + \frac{t-T}{T}u(t) - \frac{t-2T}{T}u(t)$

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

5) 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

6) Let $f(t)$ be a continuous time signal and let $F(w)$ be its Fourier Transform defined by

$$F(w) = \int_{-\infty}^{\infty} f(t)\, e^{-jwt} dt$$

Define $g(t)$

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

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 an even function.
c) $g(t)$ would be proportional to $f(t)$ only if $f(t)$ is a sinusoidal function.
d) $g(t)$ would never be proportional to $f(t)$

7) The core loss of a single phase, $230/115V$, $50Hz$ power transformer is measured from $230V$ side by feeding the primary ($230V$ side) from a variable voltage variable frequency source while keeping the secondary open circuited. The core loss is measured to be $1050W$ for $230V$, $50Hz$ input. The core loss is again measured to be $500W$ for $138V$, $30Hz$ input. The hysteresis and eddy current losses of the transformer for $230V$, $50Hz$ input are respectively,

a) $508W$ and $542W$.
b) $468W$ and $582W$.
c) $498W$ and $552W$.
d) $488W$ and $562W$.

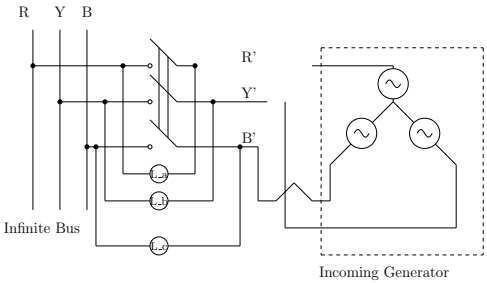
8) A $15kW$, $230V$ dc shunt motor has armature circuit resistance of 0.4ω and field circuit resistance of 230ω. At no load and rated voltage, the motor runs at $1400rpm$ and the line current drawn by the motor is $5A$. At full load, the motor draws a line current of $70A$. Neglect armature reaction. The full load speed of the motor in rpm is _____

9) A 3 phase, $50Hz$, six pole induction motor has a rotor resistance of 0.1ω and reactance of 0.92ω. Neglect the voltage drop in stator and assume that the rotor resistance is constant. Given that the full load slip is 3%, the ratio of maximum torque to full load torque is

a) 1.567 b) 1.712 c) 1.948 d) 2.134

10) A three phase synchronous generator is to be connected to the infinite bus. The lamps

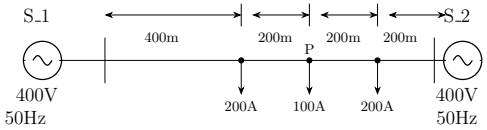
are connected as shown in the figure for the synchronization. The phase sequence of bus voltage is R-Y-B and that of incoming generator voltage is R'-Y'-B'.



It was found that the lamps are becoming dark in the sequence $L_a - Lb - L_c$. It means that 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

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



location P respectively, are

a) $75A$ and $25A$
b) $0A$ and $50A$
c) $5A$ and $75A$
d) $0A$ and $100A$

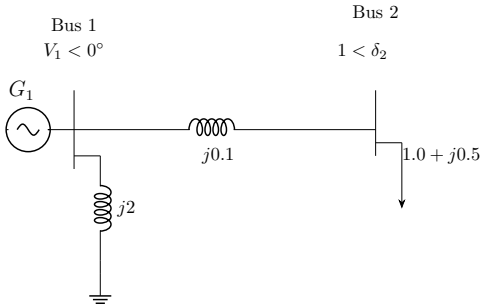
12) A two bus power system shown in the figure supplies load of $1.0 + j0.5$ p.u. The values of V_1 is p.u. and δ^2 respectively are

a) 0.95 and 6.00°
b) 1.05 and −5.44°
c) 1.1 and −6.00°
d) 1.1 and −27.12°

13) The fuel cost functions of two power plants are

$$\text{Plant } P_1 \; C_1 = 0.05Pg_1^2 + APg_1 + B$$
$$\text{Plant } P_2 \; C_2 = 0.10Pg_2^2 + 3APg_2 + B$$

where. P_{g1} and P_{g2} are the generated powers of two plants, and A and B are the



constants. If the two plants optimally share $1000MW$ load at incremental fuel cost of $100Rs/MWh$, the ratio of load shared by plantsP_1 and P_2 is

a) 1 : 4
b) 2 : 3
c) 3 : 2
d) 4 : 1