Find the synchronous speed of an 8-pole 60 Hz AC motor in revolution per minute.

A .450

B. 900

C. 750

D. 1500

ANSWER: B

63

50. $N_s = \frac{120f}{P} = \frac{1,200 \times 60}{8 4 2} 30\,15 = 900$

If an R-L load is drawing 8 kW at a power factor of 0.8 (lagging) from a single-phase A.C. supply, find the apparent power drawn by the load.

A. 10 VA

B. 6.4 VA

C. 6.4 kVA

D. 10 Kva

ANSWER: D

49. $P = 8\,KW$ $\cos\phi = 0.8$

$$\cos\phi = \frac{\text{real } P}{\text{app } P}$$

$$0.8 = \frac{8 \times 10^3}{P} \qquad P = \frac{8 \times 10^3}{0.8} = 10{,}000\ VA$$

The average value of sine wave with the peak value of 400 Vis _____V

A. 1127.4

B. 254.6

C. 1282.8

D. 1200

ANSWER: B

48. $V_g = 0.636 V_m$

$V_g = 0.636 (400)$

$= 254.4 V_{p-p}$

47

A wave completes one cycle in 10 m sec, its frequency will be _____ Hz

A. 1

B. 50

C. 100

D. 10

ANSWER: C

47.

Base = 10

$$f = \frac{1}{T} = \frac{1}{10\,ms} = \frac{1}{10 \times 10^{-3}} = \frac{1}{10} \times 10^{3}$$

$$= 0.1 \times 10^{3}$$

$$= 100\,Hz.$$

3.A DC motor takes an armature current of 110A at 480V.The armature circuit resistance is .2ohm.the machine has 6poles and the armature is lap connected with 864conductors.the flux per pole is 0.05wb .calculate speed and torque developed by the armature.

a)N=630rpm&T=750N-m

c)N=636rpm&T=756N-m

b)N=635rpm&T=786N-m

d)N=536rpm&T=856N-m

Answer: C

Armature Torque of DC Motor

Example: A DC motor takes an armature current of 110A at 480V. The armature circuit resistance is 0.2Ω. The machine has 6 poles and the armature is lap-connected with 864 conductors. The flux per pole is 0.05wb. Calculate the speed and the gross torque developed by the armature.

$$E_A = V_T - I_A R_A = 480 - 110 \times 0.2 = 458\text{V}$$

$$E_A = \frac{\phi Z N}{60} \times \frac{P}{A} = \frac{0.05 \times 864 \times N}{60} = 458 \qquad N = 636\, rpm$$

$$T_a = 9.55 \frac{E_A I_A}{N} = 9.55 \frac{458 \times 110}{636} \approx 756\text{N.m}$$

Or $\quad T_a = 0.159 \times \phi \times Z \times I_A = 0.159 \times 0.05 \times 864 \times 110 \approx 756\text{N.m}$

Example: Determine armature torque and motor speed of 220V, 4-pole series motor with 800 conductors wave connected supplying a load by taking 45A from

6. A Solenoid is wound with a coil of 100 turns. The coil is of length 50cm and is carrying a current of 2A.Determine the magnetic field strength at the line of the solenoid.

a)450AT/m
b)400AT/m
c)500AT/m
d)600AT/m

Answer: B

24. $N = 100$

$l = 50cm \Rightarrow 50 \times 10^{-2} m$

$I = 2A$

$$H = \frac{NI}{l} = \frac{100 \times 2}{50 \times 10^{-2}} = 4 \times 100 = 400 \frac{AT}{m}$$

$S = ?$

8.What is the reluctance of a material that has a length of 0.07 m, a cross-sectional area of 0.014 m2, and a permeability of 4,500 μWb/At × m?

a)1111 At/Wb

b)111 At/Wb

c)11 At/Wb

d)1 At/Wb

Answer: A

26. $S = ?$

$l = 0.07\ m$

$A = 0.014\ m^2$

$\mu = 4500\ \mu$

$$S = \frac{l}{\mu_0 \mu_r a}$$

$$S = \frac{0.07}{4\pi \times 10^{-7} \times 4500 \times 0.014}$$

$$= 884.19$$

$$S = \frac{l}{\mu A} = \frac{0.07}{4500 \times 0.014 \times 10^{6}}$$

$$= 1111\ At/Wb$$

8. What is the reluctance of a material that has a length of 0.07 m, a cross-sectional area of 0.014 m^2, and a permeability of 4,500 μWb/At × m?

- (A) 1111 At/Wb
- (B) 111 At/Wb
- (C) 11 At/Wb
- (D) 1 At/Wb

Correct Answer

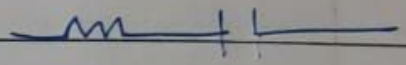
Answer: Option A

9.A 47 Ohm resistor and a capacitor with a capacitive reactance of 120 are in series across an ac source. What is the circuit impedance, Z

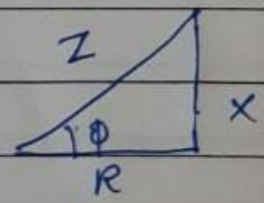
a)126ohm
b)127ohm
c)128ohm
d)129ohm

Answer: D

27. 47Ω $X_C = 120$



$Z = ?$



$$Z = \sqrt{R^2 + X_c^2}$$

$$Z = \sqrt{(47)^2 + (120)^2}$$

$$= \sqrt{2209 + 14400} = \sqrt{16609} = 128.87$$

(or) $Z = R - jX_C \Rightarrow 47 - j120$

$47\Omega - j120\Omega$ //

12.A DC generator is rotated at 50 revolutions/sec .how many times does the dc output voltage reach maximum in each second?

a)50
b)100
c)150
d)3000

Answer: B

1 cycle is completed in one revolution. In 1 cycle, it obtains two times max value.

$2 \times 50 = 100$ times //.

1.In a series RC circuit, 12V is measured across the resistor and 15V is measured across the capacitor .The source voltage is

a)3V

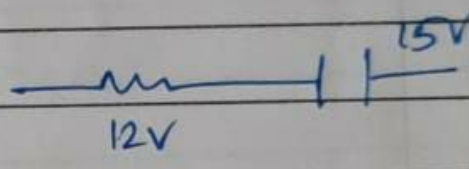
b)27V

c)19.2V

d)12V

Answer: C

31. RC



$V_s = 12 + 15 = 27$

$E_{rms} = \sqrt{V_R^2 + V_C^2}$

$= \sqrt{(12)^2 + (15)^2} = \sqrt{144 + 225} = \sqrt{369}$

$= 19.20\ V$ //.

8.The synchronous speed of a4 pole induction motor for 50hz power supply is ------rpm.

a)1500
b)1000
c)750
d)1440

Answer: A

$$= \frac{120 \times f}{\text{poles}} = \frac{120 \times 50}{4} = \frac{6000}{4} = 1500 \text{ rpm}.$$

For an alternating current with the frequency 50 Hz, the reactance of the capacitor is 10 ohms. When the frequency is increased to 60 Hz, the reactance of the capacitor becomes _____ ohms.

A. 7.56

B. 9.44

C. 8.33

D. 6.83

ANSWER: C

52. $X_C = \frac{1}{2\pi fC}$

$$\frac{X_{C1}}{X_{C2}} = \frac{\frac{1}{2\pi f_1 C}}{\frac{1}{2\pi f_2 C}}$$

$$\frac{X_{C1}}{X_{C2}} = \frac{\frac{1}{f_1}}{\frac{1}{f_2}} = \frac{1}{f_1} \times \frac{f_2}{1} = \frac{f_2}{f_1}$$

$$\frac{X_{C1}}{X_{C2}} = \frac{f_2}{f_1}$$

$X_{C1} = 10\,\Omega$ $\quad f_1 = 50\,Hz$

$X_{C2} = ?$ $\quad f_2 = 60\,Hz$

$$\frac{10}{X_{C2}} = \frac{60}{50}$$

$$\frac{10}{X_{C2}} = \frac{6}{5} \Rightarrow \frac{X_{C2}}{10} = \frac{5}{6}$$

$$X_{C2} = \frac{5 \times 10}{6} = \frac{25}{3} = 8.33\,\Omega$$

13.

14.

15

8.33
3 | 25
24
10
9
1

14.The primary winding of a transformer has 110v across it. What is the secondary voltage if the turns ratio is 8?

a)8.8V
b)88V
c)880V
d)8800V

Answer: C

14.

$\frac{N_2}{N_1} = 8$; $V_1 = 110\,V$

$\frac{V_2}{V_1} = \frac{N_2}{N_1}$

$\frac{V_2}{110} = 8$

$V_2 = 880V$

= 19.20

15.A magnetizing force of 8000A/m is applied to a circular magnetic circuit of mean diameter 30cm by passing a current through a coil wound on the circuit is 750 turned. If the coil is uniformly wound, calculate the current flow in the circuit.

a)10.05A
b)9.8A
c)11A
d)12A

Answer: A

Problem 3. A magnetizing force of 8000 A/m is applied to a circular magnetic circuit of mean diameter 30 cm by passing a current through a coil wound on the circuit. If the coil is uniformly wound around the circuit and has 750 turns, find the current in the coil.

$H = 8000$ A/m; $l = \pi d = \pi \times 30 \times 10^{-2}$ m; $N = 750$ turns

Since $H = \dfrac{NI}{l}$ then, $I = \dfrac{Hl}{N} = \dfrac{8000 \times \pi \times 30 \times 10^{-2}}{750}$

Thus, **current $I = 10.05$ A**

16.What will be the magnetic potential difference across the air gap of 2cm length in magnetic field of 200 AT/m?

a)2AT

b)4AT

c)6AT

d)10AT

Answer: B

16. $H = 200$ AT/m

$L = 2\text{cm} = 2 \times 10^{-2}\text{m}$

$$H = \frac{NI}{L} = \frac{mmf}{L}$$

NI (or) $mmf = H \times L = 200 \times 2 \times 10^{-2}$

$= 400 \times 10^{-2} = \frac{400}{100} = 4$

$= 4$ AT

2.Each phase of a 3phase star connected alternator produces a voltage of 11000V and current of 1000A at power factor 0.9.find line voltage, line current and total capacity of the alternator.

a)VL=19053V,IL=1000A,Capacity=29.7MW

c)VL=19053V,IL=1000A, Capacity=29.7MW

b)VL=2000V, IL=1500A,Capacity=25MW

d)VL=2500V,IL=500A, Capacity=35MW

Answer: A

Power factor $= \cos\phi = 0.9$

Line Voltage $= \sqrt{3} \times$ Phase voltage

$= \sqrt{3} \times 11000$

$\simeq 19053\ V$

Line Current $=$ Phase Current $= 1000\ A$

Capacity $=$ Power $= \sqrt{3}\, V_L I_L \cos\phi$

$= \sqrt{3} \times (\sqrt{3} \times 11000) \times (1000) \times 0.9$

$= 29.7 \times 10^6\ W \quad = 29.7\ MW$