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ESE- 2018 (Prelims) - Offline Test Series Test-3

ELECTRONICS & TELECOMMUNICATION ENGINEERING

SUBJECT: SIGNALS & SYSTEMS + BASIC ELECTRICAL ENGINEERING SOLUTIONS

01. Ans: (a)

Sol: $x(t) = 4\left[\frac{1-\cos 6t}{2}\right] = 2 - 2\cos 6t$

$X(\omega) = 2[2\pi\delta(\omega)] - 2[\pi\delta(\omega+6) + \pi\delta(\omega-6)]$

$X(\omega) = 4\pi\delta(\omega) - 2\pi\delta(\omega - 6) - 2\pi\delta(\omega + 6)$

02. Ans: (c)

Sol: Auto correlation function must be non-negative, even symmetric & maximum at origin. All these conditions are satisfied by 'c' option

03. Ans: (d)

Sol: $\int_1^4 \cos(2\pi t)\delta(2t-1)\,dt = \frac{1}{2}\int_1^4 \cos(2\pi t)\delta\left(t-\frac{1}{2}\right)dt$

From sifting property

$\int_{t_1}^{t_2} x(t)\delta(t-t_0)dt = x(t_0) \quad t_1 \le t_0 \le t_2$

$= 0$, otherwise

So, $\int_1^4 \cos(2\pi t)\delta(2t-1)\,dt = 0$

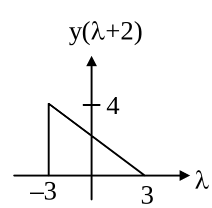
04. Ans: (c)

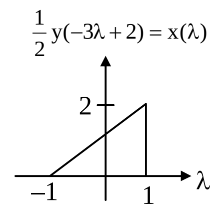
Sol: $y(t) = 2x\left(\frac{-t}{3}+\frac{2}{3}\right)$

$\frac{-t}{3}+\frac{2}{3} = \lambda \Rightarrow \frac{-t}{3} = \lambda - \frac{2}{3}$

$-t = 3\lambda - 2 \Rightarrow t = -3\lambda + 2$

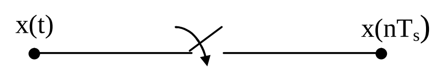
$x(\lambda) = \frac{1}{2}y(-3\lambda+2)$





05. Ans: (c)

Sol:



$t = nT_s = \frac{n}{100}$

$x(nT_s) = \cos\left[\frac{320\pi n}{100} + \frac{\pi}{4}\right]$

$= \cos\left[\frac{16\pi n}{5} + \frac{\pi}{4}\right]$

$\frac{\omega_0}{2\pi} = \frac{16\frac{\pi}{5}}{2\pi} = \frac{8}{5} = \frac{m}{N}$

8 full periods of x(t) generate one period of x(n)

06. Ans: (d)

Sol: $x(t) = e^{-2t}u(t)$ and $y(t) = e^{-t}u(t)$

$x(t)\,\delta(t-1) = x(1)\,\delta(t-1) = e^{-2}\delta(t-1)$

$y(t)\,\delta(t-2) = y(2)\,\delta(t-2) = e^{-2}\delta(t-2)$

$x(t)\,\delta(t-1) * y(t)\,\delta(t-2) = e^{-4}[\delta(t-1)*\delta(t-2)]$

$= e^{-4}\delta(t-3)$

07. Ans: (a)

Sol: $h_1(t) = \delta(t) - e^{-t}u(t)$

Transfer function of RC low pass filter is

$$H_2(s) = \frac{1}{1+s\tau} = \frac{1}{1+s} \quad \text{[given } \tau = 1\text{sec]}$$

$h_2(t) = e^{-t}u(t)$

the impulse response of parallel combination is

$$h_p(t) = h_1(t) + h_2(t) = \delta(t) - e^{-t}u(t) + e^{-t}u(t)$$

$h_p(t) = \delta(t)$

08. Ans: (c)

09. Ans: (a)

Sol: The signal y(t) can be represented in terms of x(t) as

$y(t) = x(t) - x(t-1)$

Given $x(t) \xleftrightarrow{F.S} C_n$

$$x(t-1) \xleftrightarrow{F.S} e^{-j\omega_0 n}C_n$$

$$= e^{-j\frac{2\pi}{2}n}C_n = e^{-j\pi n}C_n = (-1)^n C_n$$

$$\therefore y(t) \xleftrightarrow{F.S} C_n - (-1)^n C_n$$

10. Ans: (a)

Sol: $$x_1(t) = \sum_{\ell=-\infty}^{\infty} a_\ell e^{j\ell\omega_0 t}$$

Fourier series coefficient of

$$x_1(t)x_2(t) = \frac{1}{T_0}\int_{t=0}^{T_0} x_2(t)\left[\sum_{\ell=-\infty}^{+\infty} a_\ell e^{j\ell\omega_0 t}\right] e^{-jn\omega_0 t}dt$$

$$= \sum_{\ell=-\infty}^{\infty} a_\ell \frac{1}{T_0}\int_0^{T_0} x_2(t)e^{-j(n-\ell)\omega_0 t}dt$$

$$= \sum_{\ell=-\infty}^{\infty} a_\ell b_{n-\ell}$$

11. Ans: (b)

Sol: $x(t) = \cos(\omega_0 t)$ $\quad \omega_0 = 10\pi$

$y(t) = 10\cos(\omega_0 t) + 2\cos(3\omega_0 t) + \cos(5\omega_0 t)$

III harmonic distortion in the output is $= \dfrac{C_3}{C_1}$

$C_1 = 10, C_3 = 2$

$$\frac{C_3}{C_1} = \frac{2}{10} = 0.2 = 20\%$$

12. Ans: (a)

Sol: x(3t) is compressed by 3, so T = 2. Its power doesn't change so P = 4 watts.

13. Ans: (b)

Sol: $x(t) = e^{-3t}u(t-2)$

$= e^{-3(t-2+2)}u(t-2)$

$= e^{-3(t-2)}e^{-6}u(t-2)$

$x(t) = e^{-6}e^{-3(t-2)}u(t-2)$

$$X(s) = \frac{e^{-6}e^{-2s}}{s+3} \quad \text{-------(1)}$$

$y(t) = Ae^{-3t}u[-(t+t_0)] =$

$Ae^{3t_0}e^{-3(t+t_0)}u[-(t+t_0)]$

$$Y(s) = \frac{-Ae^{3t_0}e^{t_0 s}}{s+3} \quad \text{------(2)}$$

Given X(s) = Y(s)

$$\Rightarrow \frac{-Ae^{3t_0}e^{t_0 s}}{s+3} = \frac{e^{-6}e^{-2s}}{s+3}$$

$\therefore A = -1$ and $t_0 = -2$

$At_0 = (-1)\times(-2) = 2$

14. Ans: (b)

Sol: $$X(s) = \frac{s^2(s+2)}{s^2+9} = \frac{s^3+2s^2}{s^2+9} = s+2-\frac{9(s+2)}{s^2+9}$$

$$X(s) = s+2-\frac{9s}{s^2+9}-\frac{18}{s^2+9}$$

$x(t) = \dot{\delta}(t) + 2\delta(t) - 9\cos(3t)u(t) - 6\sin(3t)u(t)$

$\therefore y(t) + z(t) = \dot{\delta}(t) + 2\delta(t)$

15. Ans: (d)

Sol: $H(s) = \dfrac{s+1}{(s+2)(s-3)}$

$$H(s) = \frac{1/5}{s+2} + \frac{4/5}{s-3}$$

For a stable system, ROC includes imaginary axis. So, ROC = $-2<\sigma<3$

$$h(t) = \frac{1}{5}e^{-2t}u(t) - \frac{4}{5}e^{3t}u(-t)$$

16. Ans: (c)

Sol: $r_{xx}(n) = x(n)*x(-n)$

$ZT[r_{xx}(n)] = X(z).X(z^{-1})$

17. Ans: (a)

Sol: $H(z) = \dfrac{Y(z)}{X(z)} = \dfrac{1-\beta z^{-1}}{1-\alpha z^{-1}}$

for stability | pole | <1 i.e., $|\alpha| < 1$

18. Ans: (a)

Sol: $H(Z) = \dfrac{Y(Z)}{X(Z)} = \dfrac{1-\alpha}{1-\alpha Z^{-1}}$

$$H_{inv}(Z) = \frac{1}{H(Z)} = \frac{1-\alpha Z^{-1}}{1-\alpha} = \frac{Y(Z)}{X(Z)}$$

$$(1-\alpha z^{-1})X(Z) = (1-\alpha)Y(Z)$$

Take Inverse Z-Transform on both sides

$$x(n) - \alpha x(n-1) = (1-\alpha)y(n)$$

19. Ans: (d)

Sol: Here, y(n) = x(n) +x(n–5)

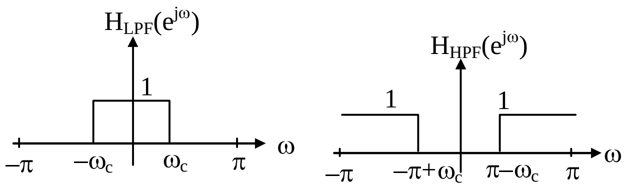
$\Rightarrow Y(e^{j\omega}) = X(e^{j\omega}) + e^{-j5\omega} X(e^{j\omega})$

$\Rightarrow Y(e^{j\omega}) = X(e^{j\omega}) (1+e^{-j5\omega})$

$\therefore a = 5$

20. Ans: (a)

Sol:



$$H_{HPF}\left(e^{j\omega}\right) = H_{LPF}\left(e^{j(\omega-\pi)}\right)$$

$$h_{HPF}(n) = e^{j\pi n} h_{LPF}(n)$$

$$h_{HPF}(n) = (-1)^n h_{LPF}(n)$$

21. Ans: (a)

Sol: $x(n)e^{j\omega_0 n} \leftrightarrow X\left[e^{j(\omega-\omega_0)}\right]$

$$y(n) = e^{j\pi n} x(n)$$

$$\Rightarrow Y(e^{j\omega}) = X\left(e^{j(\omega-\pi)}\right)$$

$$= \frac{2}{1-\frac{1}{2}e^{-j(\omega-\pi)}}$$

$$= \frac{2}{1+\frac{1}{2}e^{-j\omega}}$$

22. Ans: (b)

Sol: $x(n) \leftrightarrow X(k)$

$X(n) \leftrightarrow Nx((-k))_N$

23. Ans: (c)

24. Ans: (a)

25. Ans: (a)

Sol: Consider option(a)

$$H(z) = \frac{1-z^{-1}}{3+z^{-1}}$$

At low frequency $H(z)\big|_{z=1} = \frac{1-1}{3+1} = 0$

At high frequency, $H(z)\big|_{z=-1} = \frac{1+1}{3-1} = \frac{2}{2} = 1$

$\therefore H(z) = \frac{1-z^{-1}}{3+z^{-1}} \Rightarrow$ high pass filter

Consider option (b)

$H(z) = \frac{1+z^{-1}}{3+z^{-1}} \Rightarrow$ low pass filter

$$H(z)\big|_{z=1} = \frac{2}{4} = \frac{1}{2}$$

$$H(z)\big|_{z=-1} = \frac{1-1}{3-1} = 0$$

$H(z) = \frac{2+z^{-1}}{1+2z^{-1}} \Rightarrow$ all pass filter

26. Ans: (d)

Sol: For a stable system

1. $\int_0^{\infty} e^{-\alpha t}\,dt$ is finite
2. $\int |h(t)|\,dt$ is finite
3. Eigen values of the system are not positive and real
4. Roots of the characteristic equation lie in the left half of the s-plane.

27. Ans: (b)

Sol: 1.If the system is causal, h(t) = 0 for t < 0

2.If the system is time-variable, then the response of the system to an input of δ(t – T) is not h(t – T) for all values of the constant T.

3.If the system is static or non-dynamic, then h(t) is of the form A δ(t), where the constant A depends on the system.

∴ Options (1) and (3) are correct.

28. Ans: (b)

Sol:

(P) $y(n) = x(n)$ Linear and causal $\rightarrow$ (3)

(Q) $y(n) = x(n^2)$ Linear because $y \propto x$

Non-causal $y(-1) = x(1)$ $\rightarrow$ (2)

(R) $y(n) = x^2(-n)$ Nonlinear (squared x term)

Non-causal $y(-1) = x2(1)$ $\rightarrow$ (1)

(S) $y(n) = x^2(n)$ Non-linear (squared x term)

Causal because $y(n)$ depends on $x(n)$ $\rightarrow$ (4)

29. Ans: (d)

Sol: $$f(t) = a_0 + \sum_{n=1}^{\infty} a_n \cos(n\omega_0 t) + \sum_{n=1}^{\infty} b_n \sin(n\omega_0 t)$$

$$= a_0 + A_n \cos(n\omega_0 t + \phi_n)$$

A_n and ϕ_n (Amplitude and phase spectra) occur at discrete frequencies.

Waveform symmetries (Even, odd, Half-wave) simplify the evaluation of FS coefficients.

30. Ans: (c)

Sol: P. Reconstruction

To convert the discrete time sequence back to a continuous time signal $\rightarrow$ (2)

Q. Over-sampling

$fs >> $ Nyquist rate $\rightarrow$ (1)

R. Interpolation

Assign values between samples $\rightarrow$ (3)

31. Ans : (c)

Sol: Current through field winding,

$$I = \frac{\text{Exciting voltage}}{\text{Field winding resistance}}$$

$$= \frac{230}{100}$$

= 2.3A

Magnetic flux produced by coil (¤)=5mWb

Inductance of the coil, $L = \frac{N¤}{I}$

$$= \frac{1000 \times 0.005}{2.3}$$

= 2.1 H

32. Ans: (a)

Sol: Self inductance of coil (L) $= \frac{N^2 \mu_0 \mu_r a}{\ell}$

N = Number of turns

ℓ = Length of Coil

a = Area of cross section of coil

$$\frac{L_1}{L_2} = \left(\frac{1000}{2000}\right)^2 \times \frac{125}{62.5}$$

$$\frac{L_1}{L_2} = \frac{1}{2}$$

$L_2 = 2L_1$

33. Ans: (a)

Sol: Voltage rating of two winding transformer = 600 / 120V, 15 KVA. Voltage rating of auto transformer = 600 V / 720 V from the auto transformer ratings, can say windings connected in "series additive polarity".

From two winding transformer

$$I_{1rated} = \frac{15000}{600} = 25 \text{ A}$$

$$I_{2\,rated} = \frac{15000}{120} = 125 \text{ A}$$

In AT, due to series additive polarity

I_{pry} = 125 + 25 = 150 A

∴ Rating of AT $= E_{pry} \times I_{pry}$

= 600 × 150

= 90 KVA

Second method:

Rating of auto transformer $= \frac{1}{1-k}$

(Two winding transformer rating)

$$k = \frac{L.V}{H.V} = \frac{600}{720} = 0.833$$

$$= \frac{1}{1-0.833}(15) = 90 \text{ kVA}$$

34. Ans: (b)

Sol: Given Hysteresis loss (Ph) = 500W

Eddy current loss (P_e) = 500W

We know that $P_h \propto \frac{V^{1.6}}{f^{0.6}}$ and $P_e \propto V^2$

∴ P_{h_2} = 108.82W;

$P_{e2} = (0.5)^2 \times 500 = 125$W

∴ Iron losses = 108.82 + 125 = 233.82

= 235W

35. Ans: (a)

Sol: One of the important meanings of dots for mutually coupled coils.

If the directions for the phasor currents are so chosen by us that both currents enter (or leave) their respective windings at dots; the two currents are 180° out of phase for ampere turn balance. Again, for ampere turn balance.

If one current enters its winding at dot while the other current leaves its winding at dot, the currents are in phase.

In this problem, both currents enter their respective windings at dots. So they are 180° out of phase.

Since current in LV winding (smaller number of turns) is given as 4∠–30° A,

Current in HV winding

$$\bar{I} = \frac{50}{100}[4\angle -30° + 180°] = 2\angle 150°$$

36. Ans: (c)

Sol: I. Transformer core is made of cold rolled grain oriented steel

II. For parallel operation of transformers

Essential conditions

1. The same polarity
2. The same phase sequence
3. The relative phase displacement

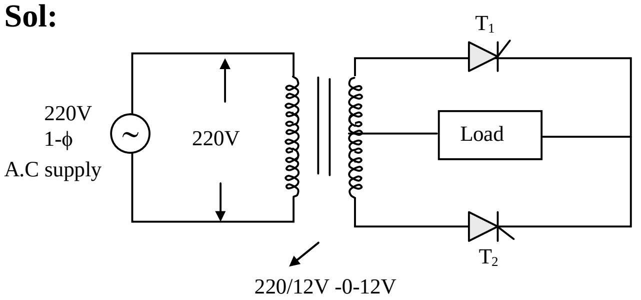
Desirable conditions

1. The same voltage ratio
2. The same per unit impedance

III. As leakage flux is more, coefficient of coupling of transformer will decrease and also the inductive reactance drop will be increased.

37. Ans: (d)

Sol:



Emf/turn = 1 V

by the voltage notation of

220 V/ 24 V – 0 V – 24 V, it is concluded that it's centre tapped transformer.

On secondary, each half should have "24 V".

So EMF/ turn = 1 V

For 24 V, we require "24" turns (for each half). So total "48" turns with centre tap.

38. Ans: (a)

Sol: $V_1I_w = 500$,

where I_w is iron loss component current.

$1000I_w = 500$

$I_w = 0.5$ A

39. Ans: (c)

Sol: If secondary of current transformer is opened, maximum flux is induced in core so that secondary induced voltage is increase and finally damages the insulation on secondary. So the secondary of C.T should never be open circuited when primary is excited.

40. Ans: (c)

Sol: x-Axis represents the magnetic field intensity or strength (H)

y-Axis represents the magnetic field density (b)

41. Ans: (c)

Sol: In power transformers, the performance can be obtained without considering the time factor.

In distribution transformers, the performance is based on both power and time basis.

Power × time = energy

$\therefore$ Energy efficiency = All – day efficiency

$$= \frac{\text{output energy in kWhr}}{\text{input energy in kWhr}}$$

→ All – day efficiency depends on load cycle.

→ All – day efficiency is less than full – load efficiency.

42. Ans: (a)

Sol: Isolation transformers provide electrical isolation between primary & secondary but there is a magnetic coupling between them.

43. Ans: (a)

Sol: I. The induction motor is generalized transformer; the no load current drawn in induction motor is more as there is air gap between stator and rotor. So current drawn at no load in induction motor is more than the transformer.

II. Pole change speed control method is suitable only to cage motors not for the slip ring induction motor. In case of cage motors rotor poles are induced poles, not in slip ring induction motor.

III. The rotor will rotate in the same direction of rotating magnetic field according to Lenz's law.

44. Ans: (c)

Sol $N_s = \frac{120f}{P} = \frac{120\times50}{4} = 1500$ rpm

$N_r = 1455$ rpm (Given)

$\therefore s = \frac{N_s - N_r}{N_s} = \frac{1500-1455}{1500} = 0.03$

Airgap power = Stator input − Stator losses
= 40 – 1 = 39 kW

Gross mechanical power output
= (1 – s) × Air gap power
= (1 – 0.03) × 39 = 37.83 kW

Shaft power output
= Gross mechanical power output – Mechanical losses
= 37.83 – 2
= 35.83 kW

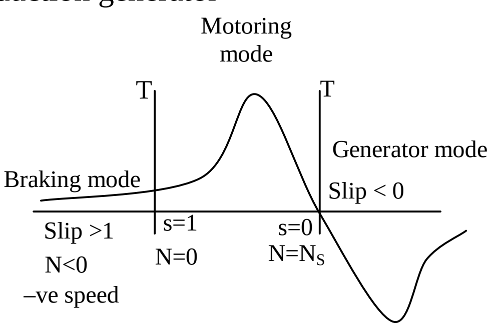
45. Ans: (d)

Sol: Slip will be negative for generation mode operation of an induction motor.

Slip (s) = $\frac{Ns - Nr}{Ns}$

When Ns > Nr, induction machine will act as induction motor

Ns < Nr, induction machine will act as induction generator



46. Ans: (a)

Sol: Emf per phase induced in synchronous motor

$E = 4.44\, k_\rho k_d\, \phi\, f\, T$

k_ρ = Coil – span factor

k_d = distribution factor

ϕ = flux per pole

f = frequency

T = Turns per phase = $\frac{720}{3} = 240$

$E_{ph} = 4.44\times0.866\times1\times25\times10^{-3}\times50\times240$
$= 1153.5$ V

47. Ans: (b)

Sol: Voltage regulation obtained in EMF method is more than actual value so it is pessimistic method.

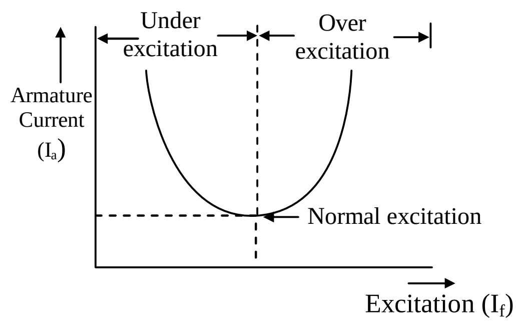
Voltage regulation obtained in MMF method is less than actual value so it is optimistic method.

From ZPF (zero power factor lag method) we can find the Potier reactance

ASA (American standard assassination) voltage regulation depends on saturation effect.

48. Ans: (b)

Sol: For a generator, with constant power delivered to an infinite bus, as field excitation is increased from a small value, phase current decreases, reaches a minimum and then starts increasing. This leads to a v-curve.



49. Ans: (a)

Sol: $\frac{N_2}{N_1} = \frac{V_2}{V_1} \times \frac{I_{sh1}}{I_{sh2}}$

$\Rightarrow \frac{N_2}{1000} = \frac{150}{200} \times \frac{200/R_{sh}}{150/R_{sh}} = 1$

$\therefore N_2 = 1000\,\text{rpm}$

50. Ans: (b)

51. Ans: (b)

Sol: (i) The graph drawn between induced voltage [E_g] and armature current (I_a) is called as internal characteristics.

(ii) The graph drawn between terminal voltage [V] and load current (I_L) is called as external characteristics.

52. Ans: (a)

Sol: Yoke is the outer frame of the DC machine and is cylinder of cast steel or rolled steel. Even number of pole cores is bolted on the yoke. The yoke serves the following two purposes.

(i) It supports the pole cores and acts as protecting cover to machine

(ii) It forms the part of magnetic circuit.

53. Ans: (d)

Sol: Since the shunt field receives the full output voltage of the generator or supply voltage of motor, it is generally made of large number of turns of fine wire carrying a small field current.

54. Ans: (d)

Sol: $P_{mech} = E_b I_a$

$= (V - I_a R_a) I_a$

For max o/p $\frac{dP_{mech}}{dI_a} = V - 2I_a R_a = 0$

$$I_a = \frac{V}{2R_a} = \frac{200}{2\times 10} = 10A$$

55. Ans: (d)

Sol: $Z_{pu\ old} = 0.30$

$MVA_{new} = 0.5\ MVA_{old}$

$kV_{b_{new}} = 0.5\ kV_{b_{old}}$

$$Z_{pu\ new} = Z_{pu\ old} \times \frac{MVA_{new}}{MVA_{old}} \times \left(\frac{kV_{b_{old}}}{kV_{b_{new}}}\right)^2$$

$$= 0.30 \times 0.5 \times \left(\frac{1}{0.5}\right)^2$$

$Z_{pu\ new} = 0.60$

56. Ans: (d)

Sol: Moderator

1. The moderator is used to slow down the neutrons, by absorbing some of kinetic energy of the neutrons by direct collision, there by decreasing the chances of fission.
2. It should have a light weight nucleus, so that it does not absorb the neutron as it collides.
3. The materials used for the moderator Graphite, ordinary water and heavy water.
4. But in a thermal nuclear reactor, ordinary water can not be used as moderator with natural uranium as fuel.
5. The multiplication factor is kept slightly greater than unity during its normal functioning because the power level increases

57. Ans: (b)

Sol: **Primary Cells:** The Primary cell once it has exhausted its activity is of no further use, i.e., once discharged cannot be recharged.

Ex: Copper zinc cell

Secondary cells:

The secondary cell can be recharged by sending current through it in the reverse direction. The secondary cells are also called as storage cells

Ex: lead-acid cell

58. Ans: (b)

Sol: Load factor (L.F) = $\frac{\text{Average load}}{\text{Maximum load}} \times 100$

$= \frac{48\,kW}{100\,kW} \times 100$

$= 48\%$

59. Ans: (b)

Sol: Given,

Water head (H) = 10m

Discharge rate (Q) = 1 m^3/s

Density of water (ρ) = 1000 kg/m^3

Efficiency (η) = 100%

Power generated (P_o) = $\eta\rho QgH$

$= 1\times 1000 \times 1 \times 9.8 \times 10$

$= 98000$ W

$= 98$ kW

60. Ans: (c)

61. Ans: (c)

62. Ans : (b)

Sol: Given,

For an alternator:

P = 8; N_S = 750 rpm

$\therefore f = \frac{N_S P}{120} = \frac{750\times 8}{120}$

= 50 Hz.

$\therefore$ Supply frequency of induction motor = 50Hz.

Given, for induction motor p = 6, S = 3%

$\therefore N_S = \frac{120f}{p} = \frac{120\times 50}{6}$ = 1000 rpm

$\therefore$ Speed of the induction motor

$= N_S(1-S) = 1000(1-0.03)$

= 970 rpm

63. Ans: (a)

Sol: $S_{mt} = \frac{R}{X}$

$S_{mt} \propto \frac{1}{f}$ (since X is proportional to f)

$\frac{0.1}{S_{mt}} = \frac{40}{50} \Rightarrow S_{mt} = 0.125$

$S_{mt} = 0.125$

64. Ans: (b)

Sol: Rotor PF = $\frac{r_2/s}{\sqrt{\left(\frac{r_2}{s}\right)^2 + x_2^2}}$

Rotor PF $\propto$ external resistance

Max. Torque is independent of rotor resistance.

65. Ans: (c)

Sol: The pumped storage plant operates as a source of electric energy during system peak hours and as a sink during off-peak hours i.e. during off-peak hours, plant acts as Pumping station which pumps the water from tail race to the head race. The starting time of pumped storage plant is very less.

66. Ans: (b)

67. Ans: (b)

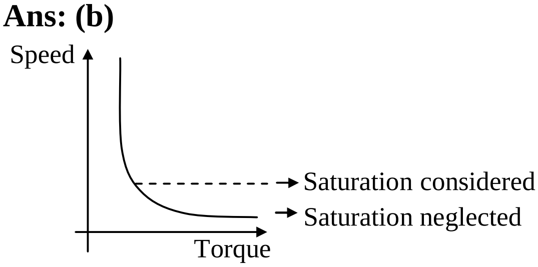
Sol: The rotating magnetic field will be produced in 3-phase windings when they are spatially arranged 120^0 apart and currents which are flowing are also 120^0 apart electrically.

68. Ans: (c)

Sol: Phase sequence of alternator depends upon the direction of rotation and independent of field current direction.

69. Ans: (b)

Sol:



We know that torque, $T \propto \phi I_a$

but flux, $\phi \,\alpha\, I_{sh}$ (for series motor, $I_{sh} = I_a$)

$\therefore\ T \propto I_a^2 \Rightarrow \sqrt{T} \propto I_a$ ………. (1)

(when saturation and armature reaction are neglected)

Speed, $N \propto \frac{1}{\phi} \propto \frac{1}{I_a}$ ……….. (2)

$\therefore$ From (1) and (2)

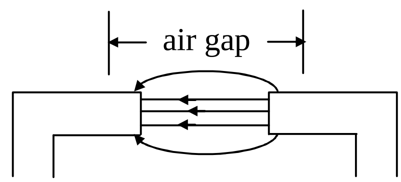
$N \propto \frac{1}{\sqrt{T}}$ ⇒ Rectangular Hyperbola

Flux 'ϕ' is constant when saturation & armature reaction are considered $\Rightarrow T \,\alpha\, I_a$

$\therefore$ Speed, $N \propto \frac{1}{\varphi}$ = constant for any value of Torque i.e, N Vs T characteristics approaches to straight line.

70. Ans: (d)

Sol:



Fringing of flux at air gap

Because of fringing, effective area of cross-section for the flux in the air gap part of the path increases. This decreases the effective reluctance of the air gap part, and hence that of the entire flux path.

71. Ans: (d)

72. Ans: (a)

Sol: A system is memory less if output, y(t) depends only on x(t) and not on past or future values of input, x(t). A system is causal if the output, y(t) at any time depends only on values of input, x(t) at that time and in the past.

73. Ans: (a)

Sol: $H(S)_{APF} = \frac{s-\alpha}{s+\alpha}$

74. Ans: (c)

Sol: FIR filters have linear phase only when it is symmetric/ anti symmetric

75. Ans: (a)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