Assignment 10

The time-averaged expression of a motor current is given by

\[ i(t) = i_0 \sin(\omega t) \]

where \( i_0 \) is the amplitude of the current and \( \omega \) is the angular frequency.

The expression of \( i(t) \) in the time domain is

\[ i(t) = i_0 \sin(\omega t) \]

The expression of \( i(t) \) in the frequency domain is

\[ I(f) = \frac{i_0}{2} \left[ \delta(f - \omega) + \delta(f + \omega) \right] \]

where \( \delta \) is the Dirac delta function.

1. Suppose the current amplitude, \( i_0 \), was found to be 2.0 A. Immediately after the measurement, we determined that the power output of the motor was 1.2 kW. What is the motor's efficiency?

2. Consider the expression of \( i(t) \) given above. Find the expression for the time-averaged value of the current, \( i_{\text{avg}} \).

3. Consider the expression of \( i(t) \) given above. Find the expression for the complex exponenti, \( e^{j\omega t} \).

4. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the voltage, \( v_{\text{avg}} \).

5. Consider the expression of \( i(t) \) given above. Find the expression for the time-averaged value of the power, \( P_{\text{avg}} \).

6. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the force, \( F_{\text{avg}} \).

7. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the torque, \( T_{\text{avg}} \).

8. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power output, \( P_{\text{out}} \).

9. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy, \( E_{\text{avg}} \).

10. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the work, \( W_{\text{avg}} \).

11. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the entropy, \( S_{\text{avg}} \).

12. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the entropy production, \( \dot{S}_{\text{prod}} \).

13. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the dissipation, \( \dot{Q}_{\text{diss}} \).

14. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy loss, \( \delta E_{\text{loss}} \).

15. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the work done, \( W_{\text{done}} \).

16. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power input, \( P_{\text{in}} \).

17. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power dissipation, \( P_{\text{diss}} \).

18. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy dissipation, \( \dot{E}_{\text{diss}} \).

19. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy loss, \( \delta E_{\text{loss}} \).

20. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the work done, \( W_{\text{done}} \).

21. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power input, \( P_{\text{in}} \).

22. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power dissipation, \( P_{\text{diss}} \).

23. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy dissipation, \( \dot{E}_{\text{diss}} \).

24. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy loss, \( \delta E_{\text{loss}} \).

25. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the work done, \( W_{\text{done}} \).

26. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power input, \( P_{\text{in}} \).

27. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power dissipation, \( P_{\text{diss}} \).

28. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy dissipation, \( \dot{E}_{\text{diss}} \).

29. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy loss, \( \delta E_{\text{loss}} \).

30. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the work done, \( W_{\text{done}} \).

31. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power input, \( P_{\text{in}} \).

32. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power dissipation, \( P_{\text{diss}} \).

33. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy dissipation, \( \dot{E}_{\text{diss}} \).

34. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy loss, \( \delta E_{\text{loss}} \).

35. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the work done, \( W_{\text{done}} \).

36. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power input, \( P_{\text{in}} \).

37. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power dissipation, \( P_{\text{diss}} \).

38. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy dissipation, \( \dot{E}_{\text{diss}} \).

39. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy loss, \( \delta E_{\text{loss}} \).

40. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the work done, \( W_{\text{done}} \).

41. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power input, \( P_{\text{in}} \).

42. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power dissipation, \( P_{\text{diss}} \).

43. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy dissipation, \( \dot{E}_{\text{diss}} \).

44. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy loss, \( \delta E_{\text{loss}} \).

45. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the work done, \( W_{\text{done}} \).

46. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power input, \( P_{\text{in}} \).

47. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the power dissipation, \( P_{\text{diss}} \).

48. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy dissipation, \( \dot{E}_{\text{diss}} \).

49. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the energy loss, \( \delta E_{\text{loss}} \).

50. The expression of \( i(t) \) is given above. Find the expression for the time-averaged value of the work done, \( W_{\text{done}} \).