1 DC Machines

Multiple Choice Questions

1. If the field winding of an unloaded dc shunt motor gets opened while running, it will
   (a) stop
   (b) run with reduced speed
   (c) run with increased speed
   (d) oscillate about original speed
   [IAS-1994]

2. A dc cumulatively compounded motor delivers rated load torque at rated speed. If the series field is short-circuited, then the armature current and speed will
   (a) both decrease (b) both increase
   (c) increase and decrease respectively
   (d) decrease and increase respectively
   [IAS-1994]

3. A separately excited dc machine, having an armature resistance of 2 ohms, was working on a 220 V supply and drawing 10 A armature current from the source when the supply voltage suddenly dropped to 200 V. Assuming that the field circuit source voltage remained unaffected, how will the armature current of the machine react to the change?
   (a) It will initially rise to 11 A and then settle down to 10 A
   (b) It will fall momentarily to 9.09 A and then slowly attain 10 A
   (c) It will reduce to zero first and then settle back to 10 A
   (d) it will remain unaffected by the change and continue to be 10 A **[IAS-1994]**

4. A dc cumulatively compounded generator was operating satisfactorily and supplying power to an infinite bus when the mechanical power supply from the prime mover failed. The machine will then run as a
   (a) differentially compounded motor with speed reversed
   (b) differentially compounded motor with the direction of speed the same as before
   (c) cumulatively compounded motor with the same direction of speed as before
   (d) cumulatively compounded motor with speed reversed
   [IAS-1994]

5. If the field circuit of a shunt motor, equipped with 3-point starter, gets interrupted accidentally while running normally, then the
   (a) starter arm will fly back to the off position
   (b) speed of the motor will rise dangerously
   (c) armature winding will draw heavy current
   (d) motor will continue to run normally
   [IAS-1994]

6. **Assertion (A):** DC shunt motors are usually fitted with interpoles.
   Reason (R): Interpoles increase the starting torque of dc shunt motors.
   (a) Both A and R are true and R is the correct explanation of A
   (b) Both A and R are true but R is NOT the correct explanation of A
   (c) A is true but R is false
   (d) A is false but R is true
   [IAS-1994]

7. **Assertion (A):** In a level compounded dc generator, the terminal voltage at full load is equal to the terminal voltage at no-load.
   Reason (R): Under load conditions, the armature reaction increases the flux per pole and thus helps maintain a constant terminal voltage.
   (a) Both A and R are true and R is the correct explanation of A.
   (b) Both A and R are true but R is NOT the correct explanation of A.
   (c) A is true but R is false.
   (d) A is false but R is true.
   [IAS-1994]

8. A shunt generator has a critical field resistance of 200 Ω at a speed of 800 r.p.m. If the speed of the generator is increased to 1000 r.p.m., what is the change in the critical field resistance of the generator?
   (a) Decreases to 160 Ω
   (b) Remains the same at 200 Ω
   (c) Increases to 250 Ω
   (d) Increases to 312.5 Ω
   [ESE-2008]

9. Two identical loss-less series motors connected in series across a dc supply voltage, run at speed of N_1 and N_2. The ratio of their output powers will be
   (a) $N_1^2 : N_2^2$ (b) 1 : 1
   (c) $N_1 : N_2$ (d) $N_2 : N_1$
   [IAS-1995]

10. In a dc machine, the demagnetising effect of armature reaction is due to
    (a) component of armature mmf along field axis
    (b) non-sinusoidal nature of armature mmf
    (c) magnetic saturation in half of the field pole
    (d) uneven air gap length
    [IAS-1995]

11. Plugging of dc motors is normally done by
    (a) connecting a resistance across the armature
    (b) reversing simultaneously the armature and field polarity
    (c) reversing the field polarity
    (d) reversing the armature polarity
    [IAS-1995]

12. A dc shunt wound motor finds application in
    (a) electric trains (b) tape recorders
    (c) blowers (d) steel rolling mills
    [IAS-1995]

13. Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:
    List-I
    A. Armature voltage control
    B. Field current control
    C. Use of diverter resistance
    D. Rheostatic control
    List-II
    1. Speeds above base speed
    2. Speeds below base speed
    3. Poor motor efficiency
    4. Speed control of series motor
    Codes:

	A	B	C	D
(a)	1	2	3	4
(b)	2	1	4	3
(c)	4	1	3	2
(d)	2	3	1	4

    [IAS-1995]

14. In dc machines, the field system has to be provided on stator unlike synchronous machine where in it could be on any member, be cause
    (a) if reduced field structure from losses.
    (b) it gives more uniform air-gap in flux distribution.
    (c) commutator action is not possible otherwise.
    (d) dc machines are comparatively low rating machines.
    [IAS-1996]

15. A bipolar dc machine with interpoles has a main-pole flux of ϕ per pole and an inter-pole flux of ϕ_1 per pole. The yoke of the machine is divided into four quadrants by the main-pole axis and the commutation axis.

The flux-distribution in the quadrants will be

(a) $\frac{1}{2}(\phi + \phi_1)$, in all the four quadrants

(b) $\frac{1}{2}(\phi - \phi_1)$ in all the four quadrants

(c) $\frac{1}{2}(\phi + \phi_1)$ in two diametrically opposite quadrants and $\frac{1}{2}(\phi - \phi_1)$ in the remaining two quadrants

(d) $\frac{1}{2}(\phi + \phi_1)$ in two adjacent quadrants, and in the remaining two quadrants

[IAS-1996]

16. A cumulatively compounded dc motor runs at 1000 rpm at no-load. On full load, the flux increases by 10%, whereas the full load drop in the combined resistance of the armature and series field is 5%. Neglecting magnetic saturation, the full load speed will be nearly

(a) 863 rpm (b) 909 rpm
(c) 1000 rpm (d) 1050 rpm

[IAS-1996]

17. A 6-pole lap-connected dc generator with 480 conductors has an armature resistance of 0.06 ohm. If the conductors are connected to form a wave winding, other things remaining unchanged, the value of the armature resistance will be

(a) 0.01 ohm (b) 0.06 ohm
(c) 0.36 ohm (d) 0.54 ohm

[IAS-1997]

18. A 2-pole series motor with its two field coils connected in series runs at a speed of 500 rpm. If the field coils are reconnected in parallel and assuming that the torque is constant and the magnetic circuit is unsaturated, the new speed will be

(a) 250 rpm (b) $\frac{500}{\sqrt{2}}$ rpm

(c) $500\sqrt{2}$ rpm (d) 1000 rpm

[IAS-1997]

19. The introduction of interpoles in between the main poles improves the performance of a dc machine, because

(a) the interpoles produce additional flux to augment the developed torque
(b) the flux waveform is improved with reduction in harmonics
(c) the inequality of air-gap flux on the top and bottom halves of the armature is removed
(d) a counter-emf is induced in the coil undergoing commutation

[IAS-1997]

20. On direct on line (DOL) starting, dc motor is found to rotate in the direction opposite to that for which it was designed.
The motor is a

(a) series motor
(b) shunt motor
(c) cumulatively compounded motor
(d) differential compounded motor

[IAS-1997]

21. Consider the following statements:
To control the speed of a dc shunt motor above the base speed over a reasonably wide range, the motor must

1. have compensating winding.
2. have interpole winding.
3. be started using a 3-point starter.
4. be started using a 4-point starter.

Of these statements:

(a) 1, 2 and 4 are correct
(b) 1, 2 and 3 are correct
(c) 1 and 3 are correct
(d) 2 and 4 are correct

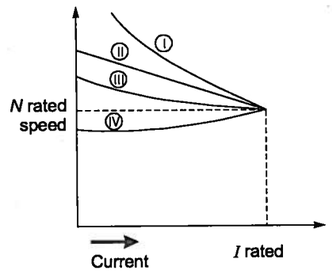
[IAS-1997]

22. In a dc machine, the armature mmf is

(a) rectangular and directed along the inter-polar axis
(b) triangular and directed along the inter-polar axis
(c) triangular and directed along the brush axis
(d) rectangular and directed along the brush axis

23. Assume that the magnetisation curve, the rated values of voltage, armature current, speed and torque are same for the following motors:

1. Series motor
2. Shunt motor
3. Cumulative compound motor
4. Different compound motor



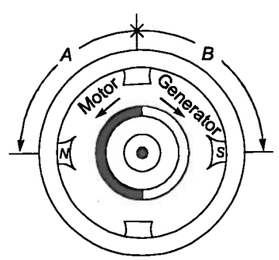
Match the type of motor with corresponding speed-current characteristics shown in the above figure and select the correct answer using the codes given below:

Codes:

	A	B	C	D
(a)	2	3	1	4
(b)	1	3	2	4
(c)	1	4	2	3
(d)	2	4	1	3

[IAS-1999]

24. If the main flux 'ϕ_m' and the commutating flux 'ϕ_c' are considered together in parts *A* and *B* of a dc machine as shown in the below figure, then the condition obtained is that



(a) ϕ_c increases the density in *A*, but decreases the density in *B*
(b) ϕ_c decreases the density in *A*, but increases the density in *B*
(c) ϕ_c increases the density in both *A* and *B*
(d) ϕ_c decreases the density in both *A* and *B*

[IAS-1999]

25. In a loaded dc generator, if the brushes are given a shift from the interpolar axis in the direction of rotation, then the commutation will

(a) improve with fall of terminal voltage
(b) deteriorate with fall of terminal voltage
(c) improve with rise in terminal voltage
(d) deteriorate withe rise in terminal voltage

[IAS-2000]

26. A dc shunt motor is required to drive a constant power load at rated speed while drawing rated armature current. Neglecting saturation and all machine losses, if both the terminal voltage and the field current of the machine are halved, then

(a) the speed becomes 2 pu (per unit) but armature current remains at 1 pu
(b) the speed remains at 1 pu but armature current becomes 2 pu
(c) both speed and armature current become 2 pu
(d) both speed and armature current remain at 1 pu

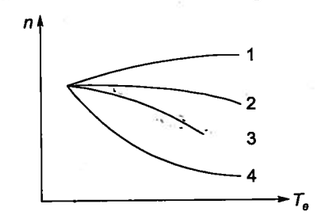
[IAS-2000]

27. The series and shunt field windings of a short shunt cumulatively compound d.c. motor get interchanged by mistake. On supplying rated voltage, the motor shall

(a) in normal direction
(b) run in the reverse direction
(c) run as differentially compounded
(d) not run

[IAS-2002]

28. The below figure shows the speed-torque characteristics of the following d.c. motors:



A. Shunt motor
B. Series motor
C. Cumulatively compound motor
D. Differential compound motor

The no-load speed of all the motor is same.
Match the type of motors with the corresponding curve using the codes given below:

Codes:

	A	B	C	D
(a)	1	4	3	2
(b)	2	3	4	1
(c)	1	3	4	2
(d)	2	4	3	1

[IAS-2002]

29. In a d.c. motor if the brushes are shifted opposite to its direction of rotation, then
(a) commutation is worsened and speed decreases
(b) commutation is improved and speed decreases
(c) commutation is worsened and speed increases
(d) commutation is improved and speed increases

[IAS-2002]

30. A d.c. shunt motor with negligible armature resistance is required to drive a constant power load. Under normal rated-load operating conditions when the terminal voltage v_t = 1.0 p.u., the speed n = 1.0 p.u. and the armature current I_a = 1.0 p.u. and, with linear magnetizing characteristic the field flux ϕ = 1.0 p.u.
If v_t = 0.5 p.u. and the flux ϕ is kept constant at 1.0 p.u., then
(a) n = 1/2 p.u. and I_a = 2.0 p.u.
(b) n = 1.0 p.u. and I_a = 2.0 p.u.
(c) n = 2 p.u. and I_a = 1.0 p.u.
(d) n = 1/2 p.u. and I_a = 1/2.0 p.u.

[IAS-2002]

31. Consider the following statements in respect of compensating windings in d.c. motors:
1. Compensating windings are connected in series with the armature.
2. Compensating windings aid commutation.
3. Compensating windings produce mmf in the same direction as that of armature mmf.

Which of these statements is/are correct?
(a) 2 and 3 (b) only 1
(c) 1 and 3 (d) 1 and 2

[IAS-2003]

32. To prevent the shifting of the magnetic neutral axis, caused by the 'armature reaction' in a d.c. machine, the most effective method to neutralize the armature flux is to
(a) shift the 'brush-axis'
(b) provide high-reluctance main pole tips
(c) cut horizontal slots in the main poles
(d) place compensating windings on the main-pole faces

[IAS-2005]

33. A 240 V, dc shunt motor draws 15 A while supplying the rated load at a speed of 80 rad/s. The armature resistance is 0.5 Ω and the field winding resistance is 80 Ω. The net voltage across the armature resistance at the time of plugging willbe
(a) 6 V (b) 234 V
(c) 240 V (d) 474 V

[GATE-2008]

34. The external resistance to be added in the armature circuit to limit the armature current to 125% of its rated value is
(a) 31.1 Ω (b) 31.9 Ω
(c) 15.1 Ω (d) 15.9 Ω

[GATE-2008]

35. In a DC machine, which of the following statements is true?
(a) Compensating winding is used for neutralizing armature reaction while interpole winding is used for producing residual flux
(b) Compensating winding is used for neutralizing armature reaction while interpole winding is used for improving commutation
(c) Compensating winding is used for improving commutation while interpole winding is used for neutralizing armature reaction
(d) Compensating winding is used for improving commutation while interpole winding is used for producing residual flux

[GATE-2006]

36. A 220 V DC machine supplies 20 A at 200 V as a generator. The armatures resistance is 0.2 ohm. If the machine is now operated as a motor at same terminal voltage and current but with the flux increased by 10%, the ratio of motor speed to generator speed is
(a) 0.87 (b) 0.95
(c) 0.96 (d) 1.06

[GATE-2006]

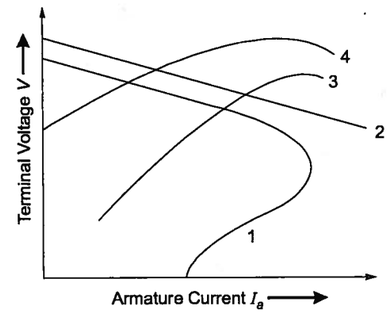
37. In a d.c. machine, for the same values of ϕ, Z and N; which one of the following statements is correct?
(a) Armature e.m.f is more with wave winding than with lap winding.
(b) Armature e.m.f. is less with wave winding than with lap winding.
(c) Armature e.m.f. depends on whether than machine is running as a motor or a generator.
(d) Armature e.m.f. is the same as long as the flux density in the air gap remains the same.

[ESE-2004]

38. Four types of d.c. generators at constant speed are considered **(List-I)**. Their external characteristics at constant speed are given in **List-II**. Match **List-I (Type of d.c. generator)** with **List-II (External characteristics)** and select the correct answer using the codes given below the lists:

List-I
A. Separately excited
B. Series excited
C. Shunt excited
D. Over-compound excited

List-II



Codes:

	A	B	C	D
(a)	2	3	1	4
(b)	1	4	2	3
(c)	1	3	2	4
(d)	2	4	1	3

39. Consider the following statements:
The speed of a d.c. motor can be controlled by the variation of
1. armature voltage.
2. field current.
3. armature circuit resistance.
4. angle of brush shift.

Which of the statements given above are correct?
(a) 1, 2 and 3 (b) 2, 3 and 4
(c) 1, 3 and 4 (d) 1, 2 and 4

[ESE-2004]

40. In DC series motor, what is the increase in the torque expressed as percentage of initial torque, if the current drawn by a d.c. motor is increased from 10 A to 12 A (Neglect saturation)?
(a) 21% (b) 25%
(c) 41% (d) 44%

[ESE-2004]

41. **Assertion (A):** In the "3-point" type of starter of a d.c. series motor, the "holding coil" for holding the starter handle in the "ON" stud is connected in such a manner that it is short-circuited when the "over load" relay picks up.

Reason (R): In a d.c. series motor starter, to guard against "racing" due to sudden larger reduction of shaft-load, the "holding coil" is connected in series with the armature circuit and the series field winding.

(a) Both A and R are individually true and R is the correct explanation of A
(b) Both A and R are individually true but R is not a correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

[ESE-2004]

42. A 400 V D.C. shunt motor takes 5 A at no-load. $R_a = 0.5$ ohms, $R_f = 200$ ohms. What is the ratio of speed from full load to no-load, when the D.C. shunt motor takes 50 A on full load?

(a) 0.94 (b) 0.8
(c) 0.6 (d) 0.4 **[ESE-2005]**

43. Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:

List-I	List-II
A. Open circuit characteristics	1. V v. I_f
B. Internal characteristics	2. E_0 v. I_f
C. External characteristics	3. E v. I_a
D. Load saturation curve	4. V v. I

Codes:

	A	B	C	D
(a)	4	3	2	1
(b)	2	1	4	3
(c)	4	1	2	3
(d)	2	3	4	1

[ESE-2005]

44. In the block diagram of a separately excited dc motor, how does the armature induced emf appear as?

(a) Positive feedback (b) Negative feedback
(c) Disturbance input (d) Output

[ESE-2005]

45. **Assertion (A):** In a d.c. generator, even though the armature magnetic field is in quadrature with the main magnetic field, each considered alone, the resultant magnetic field due to interaction of both the fields is shifted backwards by certain angle from the geometrical neutral axis depending upon the load.

Reason (R): In a d.c. generator, the trailing pole-tips get magnetically saturated as the load reaches its rated value.

(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true **[ESE-2005]**

46. A 6-pole lap wound d.c. machine armature has 720 conductors and it draws 50 A from supply mains. What is the flux distribution produced by the armature reaction per pole?

(a) Rectangular in wave shape with a peak of 500 AT
(b) Rectangular in wave shape with a peak of 100 AT
(c) Triangular in wave shape with a peak of 500 AT
(d) Triangular in wave shape with a peak of 1000 AT

[ESE-2005]

47. Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:

List-I

A. Cumulatively compound motor
B. Differentially compound motor
C. Series motor
D. Shunt motor

List-II

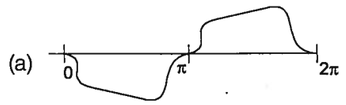
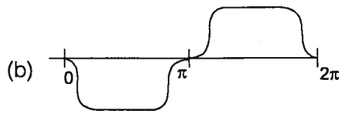
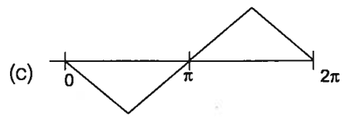
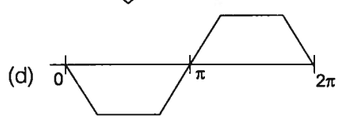
1. Fairly constant speed irrespective of the load
2. It may start in reverse direction
3. Definite no-load speed
4. Is never started without load

Codes:

	A	B	C	D
(a)	1	4	2	3
(b)	3	2	4	1
(c)	1	2	4	3
(d)	3	4	2	1

[ESE-2005]

48. What is the form of an air gap flux density waveform of an uncompensated 2-pole d.c. shunt motor at full-load?

(a) 
(b) 
(c) 
(d) 

[ESE-2006]

49. Wave winding is employed in a d.c. machine of

(a) high current and low voltage rating
(b) low current and high voltage rating
(c) high current and high voltage rating
(d) low current and low voltage rating

[ESE-2006]

50. Consider the following statements in respect of d.c. generators:

1. Compensating windings are located in teeth cut out in main poles.
2. Compensating windings are series connected so that the armature reaction is aided at any load.
3. Compensating windings are series connected for cancellation of the armature reaction at any load.
4. Compensating windings are shunt connected to aid the main poles at any load.

Which of the statements given above are correct?

(a) 1 and 2 (b) 1, 2 and 3
(c) 1 and 3 (d) 2, 3 and 4

[ESE-2006]

51. For a constant supply voltage, what are the effects of inserting a series resistance in the field circuit of a d.c. shunt motor, on its speed and torque?

(a) Speed will decrease and the torque will decrease
(b) Speed will increase and the torque will increase
(c) Speed will increase and the torque will decrease
(d) Speed will decrease and the torque will increase

[ESE-2006]

52. A 50 kW d.c. shunt motor is loaded to draw rated armature current at any given speed. When driven (i) at half the rated speed by armature voltage control and (ii) at 1.5 times the rated speed by field control, what are the approximate output powers delivered by the motor?

(a) 25 kW in (i) and 75 kW in (ii)
(b) 25 kW in (i) and 50 kW in (ii)
(c) 50 kW in (i) and 75 kW in (ii)
(d) 50 kW in (i) and 50 kW in (ii)

[ESE-2006]

53. A 5 kW, 200 V d.c. shunt motor has armature resistance of 1 ohm and shunt field resistance of 100 ohm. At no load, the motor draws 6 A from 200 V supply and runs at 1000 rpm. What is the total copper loss of the machine?

(a) 400 W (b) 16 W
(c) 36 W (d) 416 W

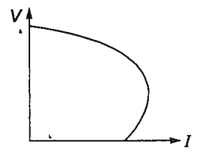
[ESE-2007]

54. Neglecting all losses, how is the developed torque (T) of a d.c. seperately excited motor, operating under constant terminal voltage, related to its output power (P)?

(a) $T \propto \sqrt{P}$ (b) $T \propto P$
(c) $T^2 \propto P^3$ (d) T is independent of P

[ESE-2007]

55. The graph shown below represents which characteristic of a d.c. shunt generator?



(a) Internal charactristic
(b) External characteristic
(c) Open-circuit characteristic
(d) Magnetic characteristic **[ESE-2008]**

56. A 4-point starter is used to start and control the speed of a
(a) dc shunt motor with armature resistance control
(b) dc shunt motor with field weakening control
(c) dc series motor
(d) dc compound motor **[GATE-2011]**

57. A 220 V, DC shunt motor is operating at a speed of 1440 rpm. The armature resistance is 1.0 Ω and armature current is 10 A. If the excitation of the machine is reduced by 10%, the extra resistance to be put in the armature circuit to maintain the same speed and torque will be
(a) 1.79 Ω (b) 2.1 Ω
(c) 3.1 Ω (d) 18.9 Ω
[GATE-2011]

58. A shunt motor running at 1000 rpm with rated voltage if voltage is reduced to half what will be the speed
(a) 1000 (b) 500
(c) 250 (d) 2000

59. Consider the following parts of a dc machine:
1. Yoke 2. Armature core
3. Brushes 4. Pole core
Which of the above parts are subjected to iron loss ?
(a) 1 and 2 only (b) 2 only
(c) 1 only (d) 1, 2, 3 and 4
[ESE-2010]

60. How many segments will be there for the commutator of a 6 pole d.c. machine having a simple wave wound armature with 72 slots?
(a) 73 (b) 72
(c) 71 (d) 70 **[ESE-2011]**

61. The air-gap between the yoke and armature in a dc motor is kept small
(a) to achieve a stronger magnetic field.
(b) to avoid overheating of the machine.
(c) to avoid locking of the armature.
(d) to avoid transverse motion.
[ESE-2012]

62. A dc series motor is running at rated speed and rated voltage, feeding a constant power load. If the speed has to be reduced to 0.25 p.u., the supply voltage should be reduced to
(a) 0.75 p.u. (b) 0.5 p.u.
(c) 0.25 p.u. (d) 0.075 p.u.
[ESE-2012]

63. A 4-pole lap wound dc generator has a developed power of P watt and voltage of E volt. Two adjacent brushes of the machine are removed as they are worn out. If the machine operates with the remaining brushes, the developed voltage and power that can be obtained from the machine are
(a) E and P (b) $E/2$ and $P/2$
(c) E and $P/4$ (d) E and $P/2$
[ESE-2013]

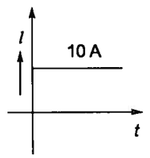
64. Consider the following statements:
The armature reaction mmf in a dc machine is
1. Stationary with respect to the field poles.
2. Rotating with respect to the field poles.
3. Rotating with respect to the armature.
Which of these statements are correct?
(a) 1, 2 and 3 (b) 1 and 2 only
(c) 1 and 3 only (d) 2 and 3 only
[ESE-2013]

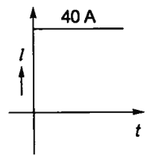
65. The induced emf of a dc machine running at 750 rpm is 220 V. The percentage increase in field flux for generating an induced emf of 250 V at 700 rpm would be
(a) 7% (b) 11.25%
(c) 21.7% (d) 42.4%
[ESE-2013]

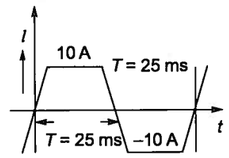
66. A dc series motor with a resistance between terminals of 1 Ω, runs at 800 rpm from a 200 V supply taking 15 A. If the speed is to be reduced to 475 rpm for the same supply voltage and current the additional series resistance to be inserted would be approximately
(a) 2.5 Ω (b) 3 Ω
(c) 4.5 Ω (d) 5 Ω **[ESE-2014]**

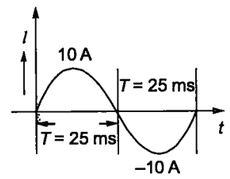
67. In a dc machine, for the same number of slots and same current in the armature conductor, which one of the following will induce higher emf?
(a) Lap winding
(b) Wave winding
(c) Compensating winding
(d) Pole winding
[ESE-2014]

Q.68 A 4-pole, lap-connected, separately excited dc motor is drawing a steady current of 40 A while running at 600 rpm. A good approximation for the waveshape of the current in an armature conductor of the motor is given by

(a)


(b)


(c)


(d)


[GATE-2016

Numerical Data Type Questions

69. A 4 pole lap wound dc generator consist of 220 turn each of resistance 0.004. _____ Ω is it's armature resistance.

70. A 8 pole lap wound dc machine has 720 conductors and the pole covers 70% of the pole pitch. _____ is the number of conductors in compensating winding on each pole.

71. The no load speed of a 230 V separately excited dc motor is 1400 rpm. The armature resistance drop and the brush drop are neglected. The field current is kept constant at rated value. The torque of the motor in Nm for an armature current of 8 A is _____.
[GATE-2014]

72. A 250 kW, 400 V, 6-pole dc generator has 720 lap wound conductors. It is given a brush lead of 2.5 angular degrees (mech.) from the geometric neutral. _____ $\frac{AT}{\text{pole}}$ is the cross-magnetizing ampere-turns per pole.

73. A dc shunt motor is driving a centrifugal pump whose load torque varies as square of speed. The pump speed is controlled by varying the armature voltage of the motor with the field current remaining constant. At full load with an armature voltage of 500 V, the armature current is 128 A. _____ is the armature voltage required to reduce the speed to $\frac{1}{\sqrt{2}}$ of its original value $R_a = 0.28\ \Omega$. Ignore the effect of armature reaction and loss torque (reduction in torque output on account of rotation losses).

74. A DC shunt generator delivers 45 A at a terminal voltage of 220 V. The armature and the shunt field resistances are 0.01 Ω and 44 Ω respectively. The stray losses are 375 W. The percentage efficiency of the DC generator is _____.
[GATE-2016

Try Yourself

T1. A 400 V series motor has a total armature resistance of 0.25 Ω. When running at 1200 rpm it draws a current of 25 A. When a regulating resistance of 2.75 Ω is included in the armature circuit, it draws current of 15 A. _____ rpm is the value of the new speed. Assume that the flux with 15 A is 70% of that with 25 A.
[Ans. : 1545.6]

T2. A 50 kW, 230 V DC shunt motor has an armature resistance of 0.1 Ω and a field resistance of 200 Ω. It runs on no-load at a speed of 1400 rpm, drawing a current of 10 A from the mains.
When delivering a certain load, the motor draws a current of 200 A from the mains. Assume that the armature reaction cause a reduction in flux/pole of 4 % of its no-load value. Then
The speed at which it will run at this load is _____ rpm and the torque developed at this load is _____ Nm.

[Ans. : 1337, 298.4]

T3. A 240 V series motor takes 40 A when giving its rated output at 1500 rpm. Its resistance is 0.3 Ω. Then find what resistance must be added to obtain rated torque at starting.

(a) 0.3 Ω (b) 3 Ω
(c) 5.7 Ω (d) 6 Ω

[Ans. : (c)]

T4. A 3 kW series motor runs normally at 800 rpm on a 240 V supply, taking 16 A the field coils are all connected in series. If the coils are reconnected in two parallel groups of two in series. The load torque increases as the square of the speed. Assume that the flux is directly proportional to the current and ignore losses.
The speed is _____ rpm and the current drawn by the motor is _____ Amp.

[Ans. : 951, 26.9]

■■■■