Electrical Engineering
[DC Machines]

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Q.1 In dc machines, the space distribution of air-gap flux density wave to no load is
(a) Sinusoidal
(b) Co-sinusoidal
(c) Flat-topped
(d) Rectangular

Q.2 A commutator in dc machines can
1. Provide half-wave rectification
2. Provide full-wave rectification
3. Convert ac to dc
4. Convert dc to ac
5. Provide controlled full-wave rectification

From these, the correct answer is
(a) 2, 3, 4   (b) 1, 2, 3
(c) 2, 3, 5   (d) 2, 3, 4, 5

Q.3 The commutator segments of dc machines are made up of
(a) Brass
(b) Copper
(c) Hard-drawn copper
(d) Copper alloy

Q.4 A 4-pole dc generator runs at 1500 rpm. The frequency of current in the armature winding is
(a) 25 Hz
(b) 50 Hz
(c) Zero Hz
(d) 100 Hz

Q.5 In normal dc machines operating at full-load conditions, the most powerful electromagnet is
(a) Field winding
(b) Armature winding
(c) Interpole winding
(d) Interpole and compensating windings together

Q.6 A bipolar dc machine with interpoles has a main-pole flux of ϕ per pole and an interpole flux of ϕ_i 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) $\frac{1}{2}$ ($\phi + \phi_i$) in all the four quadrants

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

(c) $\frac{1}{2}$ ($\phi + \phi_i$) in two diametrically opposite quadrants and

$\frac{1}{2}$ ($\phi - \phi_i$) in the remaining two quadrants

(d) $\frac{1}{2}$ ($\phi + \phi_i$) in two adjacent quadrants and $\frac{1}{2}$ ($\phi - \phi_i$) in the

remaining two quadrants

Q.7 The residual magnetism of a self-excited dc generator is lost. To build up its emf again
(a) The field winding must be replaced
(b) The armature connection must be reversed
(c) The field winding connection must be reversed
(d) Field winding must be excited by low voltage dc supply

Q.8 The flux is maximum in the following part of a dc motor:
(a) Pole core
(b) Under the interpole
(c) Under leading pole tip
(d) Under trailing pole tip

Q.9 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 V_t

(b) Deteriorate with fall of V_t

(c) Improve with rise in V_t

(d) Deteriorate with rise in V_t

Q.10 Consider the following statements about commutating poles which are fitted on most large dc shunt motors:

1. The commutation poles are placed in the geometric neutral plane and their number is usually equal to the number of main poles.
2. The winding of the commutating pole is connected in series with the shunt-field winding on the main poles.
3. The polarity of the commutating pole must be that of the next pole further ahead.
4. The commutating poles neutralize the reactance voltage produced in the coil undergoing commutation.

Of these statement:
(a) 1, 2 and 3 are correct
(b) 1 and 4 are correct
(c) 2, 3 and 4 are correct
(d) 1, 2 and 4 are correct

Q.11 **Consider the following statements:**

Interpoles in dc machines

1. Reduce armature reaction effects in the interpolar region.
2. Have the same dimensions as main poles.
3. Have their windings connected in series with the armature.
4. Have same number of turns as the armature.
5. Have the polarity same as that of the main pole ahead in a motor.

From these, the correct statement are

(a) 1, 2 and 3

(b) 1, 3 and 5

(c) 1, 2 , 3 and 5

(d) 1 and 3

Q.12 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.

Q.13 If two 8-pole dc machines of identical armatures are wound, one with lap winding and the other with wave winding, then

(a) Wave-wound machine will have more rated current and more voltage.

(b) Lap-wound machine will have more rated voltage and more current.

(c) Lap-wound machine will have more rated voltage and less current.

(d) Wave-wound machine will have more rated voltage and less current.

Q.14 DC generators are usually designed to develop armature voltages not exceeding 650 V because of the limitations imposed by
(a) Field winding
(b) Armature winding
(c) Commutator
(d) Starters

Q.15 In a dc machine, rectangle voltage:
1.   is produced due to self-inductance of the coil undergoing commutation.
2.   is the sum of emfs induced by self and mutual fluxes linking the coil undergoing commutation.
3.   causes delayed commutation.
4.   can be neutralized by transformer emf induced by interpole-flux.
5.   can be compensated by voltage commutation

From these, the correct statement are
(a) 1, 3, 4
(b)   2, 3, 4
(c) 2, 3 , 5
(d)   2, 3, 4, 5