The back emf of a dc motor..

DC MACHINES - EM

1. **Why is the armature of DC machine made of silicon steel stampings?**
   1) To reduce hysteresis loss
   2) To reduce eddy current losses
   3) For the case with which the slots can be created
   4) To achieve high permeability.
2. **The function of commutator in a DC machine is:**
   1) to change AC current to DC current
   2) to improve commutation
   3) for easy speed control
   4) to change AC voltage to DC voltage
3. **The process by which an emf induced in a DC generator is called as:**
   1) static 2) dynamic
   3) thermal 4) chemical
4. 1) Faraday's laws of electrolysis
   2) Mutual induction
   3) Faraday's law of electro-magnetic induction
   4) Lens's law
5. **Fleming's right hand rule is used to identify the:**
   1) direction of flux
   2) direction of rotation in a generator
   3) direction of current in a motor
   4) direction of induced emf
6. **The eddy current losses occurs in the ..... of DC machine**
   1) field poles 2) yoke
   3) commutating poles 4) armature core
7. **Dummy coil in a d.c. machine is used to**
   1) eliminate reactance voltage
   2) eliminate armature reaction
   3) for mechanical balance of armature
   4) none of these
8. **In a DC machine, the number of commutator segment is equal to:**
   1) number of conductors
   2) twice the number of poles
   3) number of coils
   4) none of the above
9. **The effect of armature reaction is to:**
   1) decrease the total flux
   2) increase the total flux
   3) make the air gap flux uniform
   4) none of the above
10. **The back emf in a DC motor:**
    1) opposes the applied voltage
    2) aids the applied voltage
    3) aids the armature reaction
    4) none of the above
11. **The value of back emf in a DC motor is maximum at:**
    1) no load 2) full load
    3) half full load 4) none
12. **The quantity E_bI_a represents:**
    1) input power to armature
    2) copper losses in armature
    3) core losses
    4) total friction windage and core losses
13. **To improve commutation:**
    1) interpoles are placed in GNP
    2) copper brushes are preferred
    3) copper brushes are not preferred because they have high contact resistance
    4) emf commutation is used
14. **To limit the starting current, a resistance is connected:**
    1) in series with field winding
    2) in series with the armature
    3) across the field winding
    4) across the armature
15. **The torque of DC series motor is proportional to:**
    1) I_a^2 2) I_a
    3) flux per pole 4) (speed)^2
16. **The only function of dummy coils in a DC armature winding is to:**
    1) increase the induced emf
    2) render average pitch as an integer
    3) provide mechanical balance to the armature
    4) modity its electrical characteristics
17. **Load saturation curve of a DC generator gives relation between:**
    1) V vs I_a 2) E vs I_a
    3) E_g vs I_f 4) V vs I_f
18. **The T_a/I_a graph of a DC series motor is a:**
    1) parabola from no load to over load
    2) straight line through origin
    3) parabola through out
    4) parabola upto full load and a straight lone at over loads
19. **The speed of a DC motor can be controlled by varying:**
    1) its field flux
    2) applied voltage
    3) resistance of armature circuit
    4) all of the above
20. **Fleming's Left hand rule is applied for:**
    1) motor action
    2) for generator action
    3) for motor and for generator action
    4) none
21. **When the speed of a DC shunt motor is increased its back emf will be:**
    1) decreased 2) increased
    3) remains same
    4) increases first and then decreases
22. **Speed of a DC series motor no load is:**
    1) zero 2) 1500 rpm
    3) infinity 4) none
23. **When a current carrying conductor is placed in a magnetic field:**
    1) emf is induced
    2) the conductor moves
    3) nothing happens 4) none
24. **Which test can be used to determine the no load losses of a shunt motor?**
    1) Retardation test 2) Hopkinson's test
    3) Swinburne's test 4) Brake test
25. **All rotating machines are basically:**
    1) AC machines
    2) DC machines
    3) Electromechanical converter
    4) None
26. **Basically the voltage induced in a Dc generator:**
    1) DC only 2) AC only
    3) AC an DC combined 4) None
27. **Residual magnetism is necessary in a:**
    1) self excited generator
    2) separately excited generator
    3) both of these
    4) none of these
28. **The motor used in ceiling fans is?**
    1) Resistance split phase motor
    2) Capacitor start motor
    3) Capacitor start capacitor run motor
    4) Slip ring motor
29. **The armature reaction emf in a DC machine is:**
    1) sinusoidal in shape
    2) trapezoidal in shape
    3) rectangular in shape
    4) triangular in shape
30. **The yoke of a DC machine is made of:**
    1) silicon steel 2) soft iron
    3) aluminium 4) cast iron
31. **There are two critical resistances for:**
    1) series generator
    2) separately excited generator
    3) shunt generator
    4) permanent magnet generator (one for field and other for load resistance)
32. **In DC generators, armature reaction is produced actually by:**
    1) field current
    2) armature conductors
    3) field pole winding
    4) load current in armature
33. **An ideal DC generator is one that has ..... voltage regulation**
    1) low 2) zero
    3) positive 4) negative
34. **Which of the following motor has self loading properties:**
    1) series motor 2) shunt motor
    3) cumulatively compounded motor
    4) differential compounded motor
35. **In a DC series generator, the terminal voltage, with increase in load:**
    1) decreases 2) increases
    3) remains constant 4) none
36. **The critical resistance of the DC generator is the resistance of:**
    1) armature 2) load
    3) field 4) brushes

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37. **Interpoles are usually wound with:**
    1) very fine gauge copper wire
    2) heavy gauge copper wire
    3) insulation material
    4) interpoles do not need winding
38. **The iron losses in a DC generator take place in:**
    1) yoke 2) commutator
    3) main body 4) armature core
39. **The function of the starter for a DC motor is:**
    1) to limit the starting current
    2) to limit starting voltage
    3) to increase the field resistance
    4) to reduce the armature reaction
40. **A DC motor can easily be identified by?**
    1) yoke 2) size of conductor
    3) commutator 4) winding
41. **Carbon brushes are used in electric motors to**
    1) prevent sparking during commutation
    2) provide a path for flow of current
    3) brush off carbon deposits on the commutator
    4) none of these
42. **Interpoles in dc motors are used for**
    1) increasing the speed of motor
    2) reducing sparking at the commutator
    3) decreasing the counter emf
    4) converting armature current to dc
43. **The back emf of a dc motor**
    1) adds to the supply voltage
    2) regulates its armature voltage
    3) helps in energy conversion
    4) usually exceeds the supply voltage
44. **DC motors are considered most suitable for the applications in**
    1) fans 2) water pumps
    3) traction 4) flour mills
45. **In a dc series motor, the shaft torque is less than the armature torque due to**
    1) eddy current losses 2) stray losses
    3) hysteresis losses 4) copper losses
46. **The back emf of dc motor depends on**
    1) armature speed N
    2) field flux ϕ
    3) number of armature conductors
    4) all of these
47. **Torque of a motor is**
    1) force in N-m acting on the rotor
    2) product of tangential force on the rotor and its radius
    3) the electrical power in kW
    4) power given to the load
48. **Speed of a d.c. motor depends upon**
    1) armature resistance 2) field flux
    3) applied voltage 4) all of these
49. **Ward-Leonard method is basically a**
    1) field control method
    2) field diverter method
    3) voltage control method
    4) armature resistance control method
50. **Which of the following forms an energy converter?**
    1) piezo-electric effect
    2) magneto-striction effect
    3) Hall effect 4) all of these
51. **Brushes for commutator are made of**
    1) copper 2) aluminium
    3) carbon 4) synthetic rubber
52. **Commutator of a dc machine acts as a**
    1) full wave rectifier
    2) half wave rectifier
    3) inverter 4) controlled rectifier
53. **Stray losses in a dc generator are the same as**
    1) mechanical losses
    2) magnetic losses
    3) both 1) and 2) added together
    4) none of these
54. **Overall efficiency of dc generators is usually of the order of**
    1) 60 to 70% 2) 70 to 80%
    3) 80 to 90% 4) 85 to 95%
55. **An ideal dc generator has regulation of**
    1) zero 2) 20% 3) 30% 4) 40%
56. **Commutator machines can be of the type of**
    1) d.c. machines 2) a.c. machines
    3) universal machines 4) all of these

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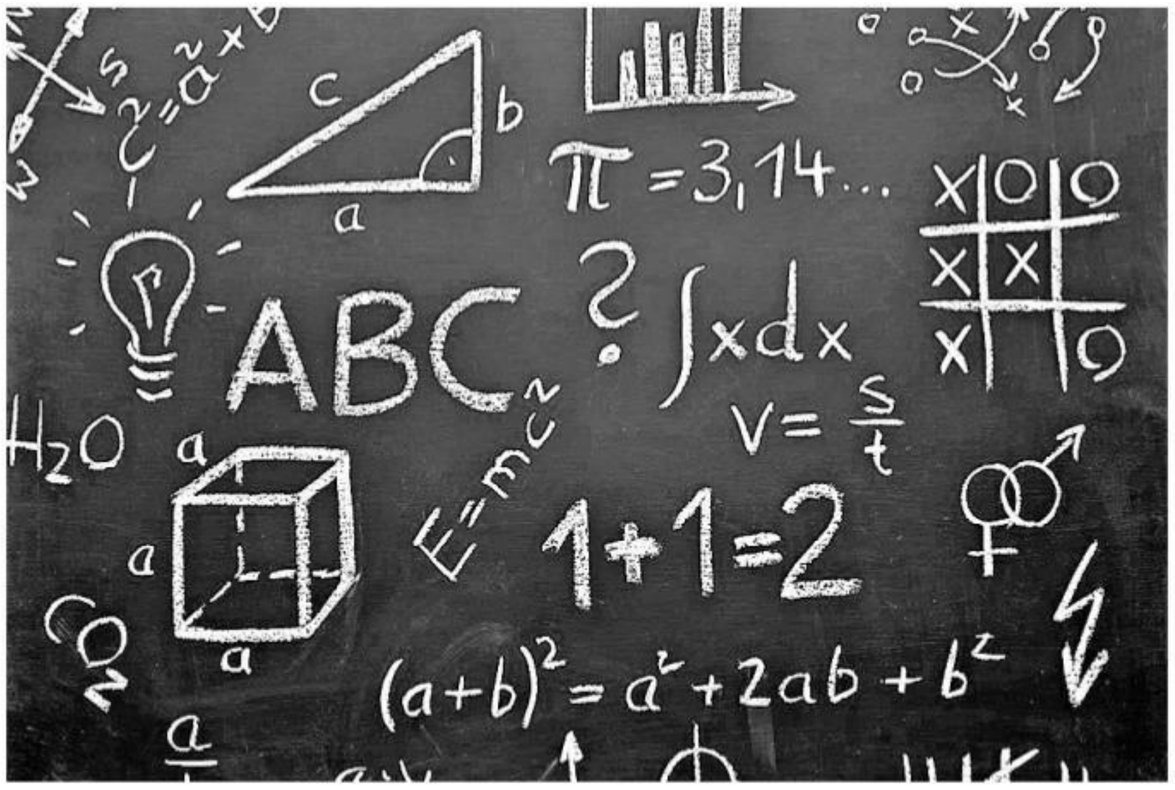
Answers

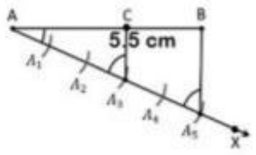
1-2	2-4	3-2	4-3	5-4	6-4
7-3	8-3	9-1	10-1	11-1	12-1
13-1	14-2	15-1	16-3	17-4	18-4
19-4	20-1	21-2	22-3	23-2	24-3
25-3	26-2	27-1	28-3	29-4	30-4
31-3	32-4	33-2	34-4	35-2	36-3
37-2	38-4	39-1	40-3	41-2	42-2
43-3	44-3	45-2	46-4	47-2	48-4
49-3	50-4	51-1	52-1	53-3	54-4
55-1	56-4				

Draw a line segment PQ..



CONSTRUCTIONS

1. Draw a line segment of length 5.5cm and divide it into the ratio 3: 2. Measure the two parts and the (this problem should be done by construction)

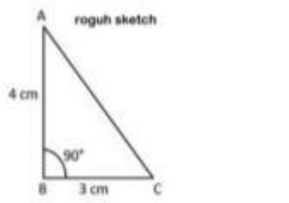


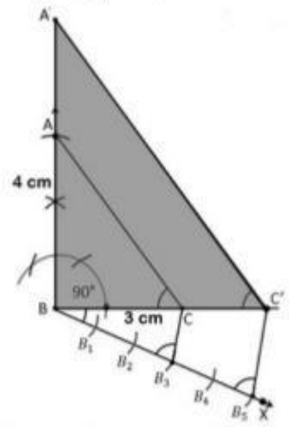
Steps of construction:

1. Draw a line segment of 5.5 cm and draw any ray AX, making an acute angle with $\overline{AB}$.
2. Locate 5(5 = 3 + 2) equal points as A_1, A_2, A_3, A_4, A_5 such that $AA_1 = AA_2 = A_2A_3$..... A_4A_5 join BA_5.
2. Through the point A_3 draw a parallel line to BA_5 which intersects AB at C.
3. C is the point dividing the line segment AB of 5.5cm in the required ratio of 3: 2. (∴ AC : CB = 3 : 2)
4. The lengths of AC and CB can be measure it comes out to 3.3 cm and 2.2 cm respectively.

2. Draw a right triangle in which the sides (other than hypotenuse) are lengths 4 cm and 3cm. Then construct another triangle whose sides are $\frac{5}{4}$ times corresponding sides of the given triangle

Sol:



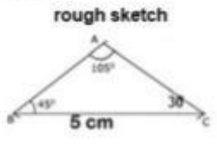


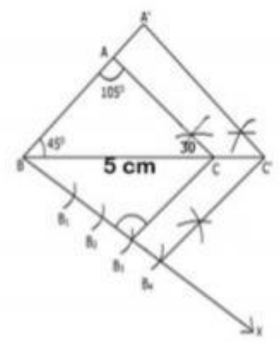
Steps of construction:

1. Draw a triangle ABC with BC = 3cm, AB = 4cm and ∠ABC = 90°.
2. Draw any ray BX making an acute angle with BC.
3. Locate 5 (greater of 5 and 3 in $\frac{5}{3}$) points. B_1, B_2, B_3, B_4, B_5 on BX such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5$.
4. Join B_3C and draw a line through B_5 parallel to B_3C to intersect BC at C/.
5. Draw a line through C/ parallel to the line CA to intersect BA at A/, then we have a triangle A/BC/ is the required triangle.

3. Draw a triangle ABC with side BC = 7cm, ∠B = 45°, ∠A = 105° then construct a triangle whose sides are $\frac{4}{3}$ times the corresponding sides of triangle ABC.

Sol:

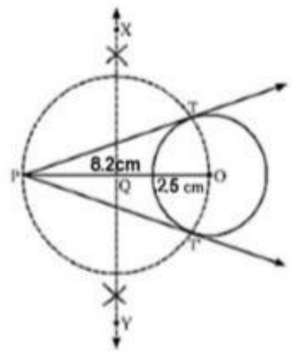




Construction Steps:

1. Draw a triangle ABC with BC = 5cm, ∠B = 45°, ∠C = 30° (since we have ∠A = 105° , ∠B = 45° using angle sum property)
2. Draw any ray BX making an acute angle with BC.
3. Locate 4(the greater of 3 and 4 in $\frac{4}{3}$) points B_1, B_2, B_3, B_4 on BX such that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4$.
4. Join B_3C and draw a line through B_4 parallel to B_3C to intersect BC at C/ (extended part of BC)
5. Draw a line through C/ parallel to the line CA to intersect BA at A/(extended part of BA). Nowwe have a triangle A/BC/ is the required triangle.

4. Draw two tangents to a circle of radius 2.5cm from a point P at a distance of 8.2cm from the centre.

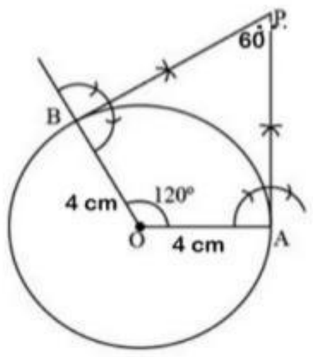


Sol:

Steps of construction:

1. Draw a circle with O as a centre and radius 2.5cm.
2. Mark a point P outside the circle such that OP = 8.2cm
3. Join OP, draw the perpendicular bisector XY of OP, intersects at Q.
4. Draw a circle with Q as cetre and radius PQ or OQ to interecct the given circle at T and T'.
5. Join PT ant PT' which are the required tangents.

5. Draw a pair of tangents to a circle of radius 4 cm which are inclined to each other at an angle of 60°.

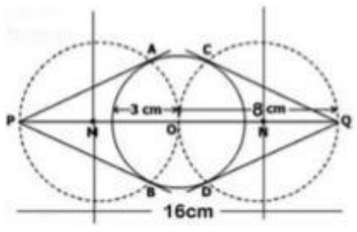


Steps of construction:

1. Draw a circle with O as a centre and radius 4 cm.
2. Draw a radius OA = 4cm, and draw ∠AOB = 120°.
3. Draw the perpendiculars to OA and OB which intersect at P
4. Measure ∠APB = 60°(i.e, tangents inclined each other at angle of 60°
5. Which is the required construction.

6. Draw a circle of radius 3cm, take two points P and Q on one of its extended diameter each at a distance of 8cm from its centre. Draw tangents to the circle from these points P and Q.

Sol:

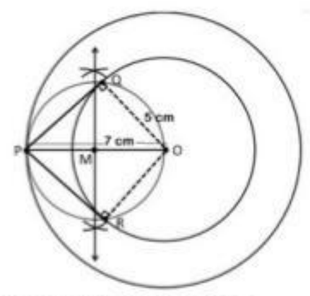


Steps of construction:

1. Draw a line segment PQ of 16 cm.
2. Take the midpoint as O of PQ
3. O as centre draw a circle of radius 3cm
4. Draw the perpendicular bisectors of PO and OQ which intersects at points M and N respectively.
5. With centre M and radius PN = NO draw a circle.
6. With centre N and radius NQ = NO draw another circle.
7. Which intersects the previous circles at the points A, B, C and D.
8. Join PA, PB, QC, QD these are the required tangents.

7. Construct a tangent to a circle of radius 5cm from the point on the concentric circle of radius 7cm and measure its length. Also verify the measurement by actual calculation.

Sol:



Steps of construction:

1. Draw two circles of radius 5cm and 7cm respectively with O as a centre. PO
2. Take a point P on the outer circle and join $\overline{PO}$
3. Draw the perpendiculars to $\overline{PO}$ which intersect $\overline{PO}$ at M and small circle at Q and R.
4. Join $\overline{PQ}$ and $\overline{PR}$. measure the length $\overline{PQ} = \overline{PR}$ = 4.9 cm.
5. Which is the required construction.

Verification:

Δ PQO and Δ PRO are right triangles at Q and R respectively. According to Pythagoras theorem

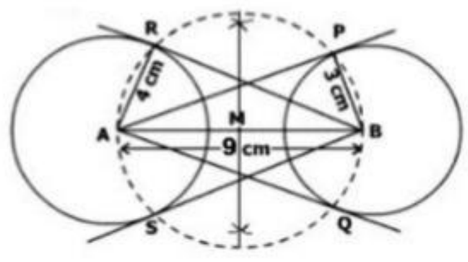
$\overline{PQ} = \overline{PR} = 4.9 = \sqrt{\overline{OP}^2 - \overline{OQ}^2}$

$= \sqrt{7^2 - 5^2} = \sqrt{49 - 25} = \sqrt{24} = 4.9$

hence verified.

8. Draw a line segment AB of length 9 cm, taking A as centre, draw a circle of radius 4 cm and taking B as centre, draw another circle of radius 3cm. Construct tangents to each circle of the centre of the other circle

Sol:



Steps of construction:

1. Draw a line segment AB = 9 cm.
2. A, B as centre draw circle of 4cm and 3cm respectively.
3. Draw the perpendicular bisector of AB which intersects at M.
4. MA = MB as centre draw a circle which intersect previous circles at R, S, P and Q.
5. Join AR, AS, BP, BQ, these are the required tangents.

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