2) Can an induction motor run at synchronous speed ? Explain with reasons.

3) What do you mean by rotating magnetic field ? Derive a relation for the magnitude of RMF. State how can you reverse the direction of rotation of a three phase induction motor ?

4) Derive relations between Tmax, Tfull load and Tstart in terms of different slips.

5) A 12 pole, three phase, 60 Hz induction motor runs at a slip of 2 % on full load.

- Find synchronous speed (Ns) and actual speed (N) of the motor.
- Now, if the speed drops further by 10 % because of additional load, find the **new speed** and **new slip** of the motor.
- Also calculate the frequency of the emf induced in the rotor for both the speeds.

Q.5 B) Explain why a single phase induction motor does not possess high starting torque ? With a neat sketch and relevant phasor diagram, explain the construction and working principle of a single phase induction motor. **(9 Marks)**

Q.5) A) Attempt any two **(9 X 2 = 18 Marks)**

1) What is rotating magnetic field ? Derive an expression for the amount of flux developed in the air gap of a three phase induction motor.

2) With a neat sketch explain the T-S characteristic of a three phase induction motor.

3) An 8 pole, three phase, 60 Hz induction motor runs at a slip of 6 % on full load. Find the actual speed of the motor. Now, if the speed is to be reduced by 20 % by changing the frequency of the supply at the same slip, find the new frequency essential for the purpose. Also, for both the cases, find the frequency of the emf developed in the rotor.

Q.5 B) Compare single phase induction motor with three phase induction motor with respect to the self starting feature. **(7 Marks)**

Q.5) A) Attempt any <u>two</u> :- (9 X 2 = 18 Marks)

1) Derive the expression for the resultant flux produced by a three phase rotating magnetic field in an Induction Motor.

2) Derive the expression for the Torque equation of a three phase Induction Motor.

3) Draw neat sketches of the rotors of three phase Induction M[illegible]. State [illegible] merits and demerits over each other.

B) Write a note on single phase Induction [illegible]otor. (7 Marks)

[illegible]

Q.5) A) Attempt any [illegible] of the [illegible], 3rd is [illegible] <u>pulsory</u> :- (6 X 3 = 18 Marks)

1) Draw Torque-Slip characte[illegible] of a th[illegible]phase induction motor. Discuss all important points associated with it. Show 1) Tstart, 2) [illegible]max, 3) slip at Tmax, 4) stable zone and 5) unstable zone on it. Explain effect of addition of extra resistance in the rotor circuit on the Tstart.

...y a starter is required for a DC motor ? With a neat sketch explain the construction and working of a **4 point starter**. (4 Marks)

B) Derive the **emf** equation of a DC generator.

Q 6) A) Attempt any <u>two</u>. (10 X 2 = 20 Marks)

1) With a neat phasor diagrams derive the relation for the magnitude of rotating magnetic field in terms of peak value of flux.

2) A 515 V, 65 Hz, 3 phase, 4 pole induction motor gives a useful output of 25 HP (metric). The mechanical losses are 950 W. The motor runs at a p.f. of 0.82 lagging and at a speed of 1850 RPM on full load. Assuming stator losses of 1350 W, calculate the <u>line current</u> taken by the motor. Also calculate <u>overall efficiency</u> of the motor. Draw power flow diagram of the induction motor and fill in proper values in all the blocks

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Q 6) A) Attempt any <u>two</u>. (10 X 2 = 20 Marks)

1) With a neat sketch explain the torque slip characteri... of a 3 ...e ...duc... n motor. What is the relation between T and s ? What do ...an by s a... a... nstable ...nes on the characteristics ?

2) Explain how a rotating magneti...eld is d...ned i... phase Induct... motor. Also derive the relation for it... magnitude with ... ...agram ...ow can you reverse the direction of rotation ... a three ...e ...uctio... motor ?

3) A 4 pole, 50 H... 3 ph... ...uc... ...or deve... a maximum torque of 160 N-m at a speed of 1280 rpm. ...alcu...a ...

1) the sync...hous s...d Ns

2) slip Sr... $\frac{500 - 1280}{1500}$

3) frequency of rotor emf $f_{2r} = sf$

4) gross power developed

$T\omega = P = \sqrt{3} V_L I_L \cos\phi$

$P = T\omega$ $\quad 2\pi N$ $\quad 60$

$160 \times 2\pi \frac{1280}{60}$

B) Derive the condition for maximum torque. (4 Marks)

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