Scheme - I

Sample Question Paper

Program Name : Electrical Engineering Program Group

Program Code : EE/EP/EU

Semester : Fifth

Course Title : Industrial AC Machines

Max. Marks : 70

$\boxed{\textbf{22523}}$

Time: 3 Hrs.

Instructions:
(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Sub-questions in a main question carry equal marks.
(5) Assume suitable data if necessary.
(6) Preferably, write the answers in sequential order.

Q.1 Attempt any Five of the following. 10 Marks
   a) Define slip and synchronous speed of 3 phase induction motor.
   b) State any two application of repulsion motor.
   c) Define chording factor and distribution factor.
   d) Define synchronous reactance &synchronous impedance.
   e) State methods of starting of synchronous motor.
   f) List any four applications of BLDC motor.
   g) Draw schematic diagram of AC servo motor.

Q.2 Attempt any Three of the following. 12 Marks
   a) "Three phase induction motor can never run on synchronous speed".Justify
   b) Draw neat diagram of star-delta starter for three phase induction motor.
   c) Explainhunting in synchronous motor.State its causes and effects.
   d) Derive the EMF equation of Alternator. State the meaning of each term used therein.

Q.3 Attempt any Three of the following. 12 Marks
   a) Compare slip ring induction motor with squirrel cage induction motor on any four parameters.
   b) "Three phase induction motor is known as generalized transformer". Justify.
   c) Explain the reason for a single phase induction motor being not self-starting.
   d) A 3 phase, 50Hz, 8 pole alternator has star connected winding with 120 slots and 8 conductors per slot. The flux per pole is 0.05 Wb, sinusoidally distributed. Determine the phase and line voltages.

Q.4 Attempt any Three of the following. 12 Marks
   a) The power input to a six pole,3 phase,50 Hz induction motor is 42 kW, the speed being 970 rpm . The stator losses are 1.2 kW and friction and windage losses are 1.8 kW. Find i) slip, ii) Rotor Output iii) Rotor copper loss and iv)Efficiency.
   b) Describe with neat sketch the working of shaded pole induction motor.

c) Discuss the role of capacitor in single phase capacitor start capacitor run induction motor.
d) Describe the working of synchronous reluctance motor with the help of neat diagram.
e) Draw and explain torque speed characteristics of stepper motor.

Q.5 Attempt any Two of the following.   **12 Marks**

a) A three phase, 4 pole,50Hz, induction motor has rotor impedance of$(0.03 + j\,0.15)$ ohm per phase. Calculate speed of motor when delivering maximum torque. Calculate the resistanceto be added to achieve 3/4th of maximum torque at the time of starting.

b) Draw and explain torque speed characteristics of universal motor and suggest the applications of the same.

c) Define voltage regulation of alternator.A 400V,10 KVA , 3 phase star connected alternator has resistance per phase of 1.0 ohm. Open circuit voltage per phase of 90V is obtained for field current of 1.0 A. For the same field current,short circuit current per phase is 15A. Calculate: i) Synchronous impedance,ii) synchronous reactance,iii)open circuit voltage per phase and iv) Regulation while supplying a load current of 15Aat 0.8 power factor lag.
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Q.6Attempt any Two of the following.   **12 Marks**

a) Draw and explain V and inverted V curves of synchronous motor.

b) A 20 pole,693V, 50 Hz,3 phase, delta connected synchronous motor is operating at no load with normal excitation. It has armature resistance per phase of zero and synchronous reactance of 10 ohm. If the rotor is restarted by 0.5 degree(mechanical) from its synchronous position , compute i) rotor displacement in electrical degrees ii) armature emf/phase iii) armature current /phase, iv) power drawn by the motor and v) power developed by armature.

c) In case of alternator, explain armature reaction and its effects on i) unity power factor, ii) zero pf lagging and iii) zero pf leading.

Scheme - I

Question Test Paper - I

Program Name	: Electrical Engineering Program Group
Program Code	: EE/EP/EU
Semester	: Fifth
Course Title	: Industrial AC Machines
Max. Marks	: 20

22523

Time: 1 Hour

Instructions:
(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Sub-questions in a main question carry equal marks.
(5) Assume suitable data if necessary.
(6) Preferably, write the answers in sequential order.

Q.1 Attempt any FOUR.   **08 Marks**

    a. State working principle of three phase induction motor..

    b. Give any two advantages of slipring rotor over squirrel cage rotor.

    c. A three phase,50 Hz induction motor runs at 960rpmon full load

       Find number of poles and percentage slip.

    d. Draw the torque slip characteristics of three phase induction motor.

    e. State the function of centrifugal switch in single phase induction motor.

    f. Give any two application for i) Universal motor and ii) Hysteresis motor.

Q.2 Attempt any THREE.   **12 Marks**

    a. Draw the power flow diagram of three phase induction motor.

    b. A 3 phase, 50 Hz 8 pole induction motor has full load slip of 2%. The rotor resistanceand standstill rotor reactance per phase are 0.001 ohm and 0.005 ohm respectively. Find the ratio of maximum to full load torque and the speed at which the maximum torque occurs.

    c. Compare soft starter with conventional starter on any four parameters.

    d. Explain with necessary diagram,working of capacitor start capacitor run induction motor.

    e. Describe the procedure to maintain capacitor start induction run single phase induction motor.

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Scheme - I

Question Test Paper - II

Program Name   : **Electrical Engineering Program Group**

Program Code   : **EE/EP/EU**

Semester   : **Fifth**

Course Title   : **Industrial AC Machines**

Max. Marks   : **20**

22523

Time: 1 Hour

Instructions:
(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Sub-questions in a main question carry equal marks.
(5) Assume suitable data if necessary.
(6) Preferably, write the answers in sequential order.

Q.1 Attempt any FOUR.   **08 Marks**

    a. Compare cylindrical rotor with salient pole rotor on any two points.

    b. Define synchronous reactance. State its formula.

    c. Draw vector diagram of loaded alternator at lagging pf.

    d. State working principle of operation of synchronous motor.

    e. List various losses occurring in synchronous motor.

    f. Give one application each for AC and DC servo motor.

Q.2 Attempt any THREE.   **12 Marks**

    a. State any four advantages of having stationary armature in case of three phase alternator.

    b. Calculate the distribution factor for 36 slots, 4 pole, single layer three phase winding.

    c. Describe any two method of starting synchronous motors.

    d. Explain hunting and phase swinging in synchronous motor.

    e. Draw &explain torque slip characteristics of permanent magnet synchronous motor.