Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R,S) (FT/WP)(S3 PT) Examination November 2025 (2019 Scheme)

Course Code: EET307

Course Name: SYNCHRONUS AND INDUCTION MACHINES

Max. Marks: 100   Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)   Marks

1	Define pitch factor and derive an expression for it.	3
2	List out the ways for eliminating harmonics in generated EMF of an alternator.	3
3	Describe the variation in synchronous reactance between the direct and quadrature axes in a salient pole alternator.	3
4	Enumerate the conditions of parallel operation of two alternators.	3
5	Draw phasor diagram of under excited synchronous motor.	3
6	The frequency of EMF in the stator of a 4 pole induction motor is 50Hz and that of rotor is 1.5Hz. Calculate the speed at which motor is running .	3
7	Explain necessity of starters in 3 phase induction motors.	3
8	Briefly explain cogging in induction motors.	3
9	Explain why single phase induction motor is not self starting.	3
10	List the applications of shaded pole type single phase induction motor.	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11 a) Explain constructional details of salient pole and cylindrical type alternators   7
        with neat sketches.

    b) A 4 pole,50 Hz 3 phase star connected alternator has 4 conductors per slot   7
        and number of slots per pole per phase is 4. It is having flux per pole of 0.12
        Wb and double layer winding . Calculate no-load line voltage when the coil
        span is 150 degree.

12 a) The stator winding of a 4 pole, three phase alternator has 48 slots. Each coil   4
        spans 11 slots. Calculate the pitch factor and distribution factor.

    b) Sketch phasor diagrams of alternator operating at i) Unity power factor,   10
        ii)lagging power factor and iii) leading power factor.

Module -2

13   A 20000kVA, 6000V three phase alternators has following OCC at normal   14
        speed.

If (A)	14	18	23	30	43
Voc line		4000	5000	6000	7000	8000

        A field current of 17 A is required to circulate full load current at short circuit
        condition. Determine the voltage regulation of alternator at full load , 0.8 pf
        lagging using i) EMF method and ii) MMF method.

14 a) Explain slip test to determine Xd and Xq of salient pole alternator.   7

    b) Explain method of synchronization of alternator by using dark lamp method   7
        with the help of neat diagram.

Module -3

15 a) Draw and explain V curve and inverted V curve of a synchronous motor.   7

    b) A 4 pole 3 phase , 500V , 50Hz induction motor develops 15 kW power   7
        including mechanical losses at 1450 rpm with power factor of 0.86 lagging.
        Calculate i) the slip ii) Rotor input iii) Rotor Copper loss iv) line current and
        v) motor input if stator loss is 1000 W.

16 a) Synchronous motor is not self starting, why? Explain.   7

    b) A three phase 10 hp , 230V , star connected synchronous motor delivers full   7
        load at a pf of 0.707 leading . The synchronous reactance of the motor is 5
        Ohm per phase . The mechanical loss is 300W . Calculate efficiency of the
        motor and generated voltage of the motor. Assume armature winding
        resistance as zero.

Module -4

17   A 15kW, 400 V, 50 Hz, 3 phase star-connected induction motor gave the   14
        following data (line values):
        No load test : 400 V, 9A, 1.25 kW
        Short circuit test : 200 V, 50 A, 7.5kW
        From the circle diagram find (a) the line current and power factor at full
        load, the maximum output power and stator Cu loss at stand still.

18 a) Describe working of Star -delta starter used in 3 phase induction motors   7

    b) Explain any two methods for speed control in induction motors.   7

Module -5

19 a) Explain working of induction generator at grid connected mode and at self   10
        excited mode.

    b) List the applications of single phase induction motors   4

20 a) Explain working of Capacitor start induction motor and shaded pole type   10
        single phase induction motor with neat sketches.

    b) Sketch and torque - slip curve of single phase induction motor.   4

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