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EGS-171

B.E. 3rd Semester (CGPA) Elect. and Commun. Engg. (Zero Sem.) Examination - 2018

ELECTROMECHANICAL ENERGY

Paper–EL–302

Time : 3 Hours]   [Maximum Marks : 60

Note : (i)   Attempt all questions.

(ii) Use of scientific calculator is required.

1. Choose any five-   10

(i)   The frequency of voltage generated by an alternator having 8 poles and rotating at 250 rpm is-

(a)   60 Hz   (b) 50 Hz

(c)   25 Hz   (d) $16\frac{2}{3}$ Hz

(ii) The construction of a synchronous motor resembles which of the following machine?

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(a) an induction motor

(b) rotor converter

(c) Alternator

(d) Series motor

(iii) The difference between the synchronous speed and the actual speed of an induction motor is known as-

(a) regulation (b) back lash

(c) slip (d) lag

(iv) An inducation motor works with-

(a) dc only (b) ac only

(c) both ac and dc (d) none of them

(v) The motor used for signal and timing device is-

(a) Reluctance motor

(b) Shaded pole motor

(c) Hysteresis motor

(d) Capacitor motor

(vi) Which of the following relationships is not valid for short transmission lines?

    (a) $B = Z = C$

    (b) $A = D = 1$

    (c) $I_s = I_r$

    (d) None of the above

(vii) In medium transmission line the shunt capacitance is taken into account in-

    (a) T- method

    (b) π - method

    (c) All of the above

    (d) None of the above

(viii) Which of the following regulation is considered to be the best-

    (a) 2%   (b) 30%

    (c) 70%   (d) 98%

(ix) Starting torque of an induction motor is proportional to-

    (a) V_s (b) $(V_s)^2$

    (c) $\frac{1}{2} V_s$ (d) $(V_s)^{\frac{1}{2}}$

(x) In 'cogging', the motor–

    (a) refuses to start at no load

    (b) runs at low speed

    (c) runs with excessive vibrations

    (d) runs with excessive sound

2. (a) Write a short note on three phase rotating magnetic field.   5

    (b) Derive torque equation for a single phase salient pole machine.   5

<div align="center">or</div>

    (a) Draw a schematic diagram indicating flow of energy in the conversion of electrical energy into mechanical form. Discuss in brief the steps involved.   5

    (b) For a linear magnetic circuit derive the expressions for stored energy and co-energy.

3. (a) Draw the Torque-slip characteristic of an induction motor. Indicate the region where characteristic is nearly linear.   5

(b) A 8-pole, three phase induction motor is supplied from 50 Hz, AC supply. On full load, the frequency of induced emf in rotor in 2Hz. Find the full load slip and the corresponding speed. 5

or

(a) Explain rotor resistance speed control of induction motors. State its limitations. 5

(b) Draw and explain the phasor diagram of 3 phase induction motor. 5

4. (a) Explain the double revolving field theory of single phase induction motor. 5

(b) What is a hysteresis motor, explain its working and characteristics. 5

or

(a) Explain the working of capacitor start capacitor run induction motor. 5

(b) Discuss the principle of operation and working of universal motor. 5

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5. (a) Discuss the constructional features of cylindrical rotor and salient pole alternators and comment on their ratings. 5

   (b) A 3-phase, 800 kVA, 11 kV, star connected alternator has resistance of 1.5Ω/ phase and synchronising reactance of 25Ω/ phase. Find the percentage regulation for a load of 600 kW at 0.8 leading power factor.

or

   (a) Write a short note on "hunting" in an alternator. 5

   (b) Draw the power angle diagram. Give an expression for power output in terms of power angle. 5

6. (a) Give the equivalent circuit representation for a short, medium and long transmission line. 5

   (b) What is the effect of transmission voltage on line efficiency, show through derivation. 5

or

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(a) Derive the generalized circuit constants A, B, C, D for medium tone by nominal T-method.

5

(b) Derive an expression for volume of copper required for Two wire d.c. system with mid-point earthed.

5