

KATHMANDU UNIVERSITY  
End Semester Examination [C]  
May/June, 2019

Marks Scored:

Level : B.E.  
Year : IV

Course : EPEG 422  
Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

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**SECTION "A"**

[20Q.  $\times$  0.5 = 10 marks]

Choose the most appropriate answer among the given options and **encircle** the letter of your choice.

- A 15 hp, 220V, 2000 rpm separately excited dc motor controls a load requiring a torque of  $T_L = 45$  Nm at a speed of 1200 rpm. The field circuit resistance is  $R_f = 147\Omega$ , the armature circuit resistance is  $R_a = 0.25\Omega$ , and the voltage constant of the motor is  $K_v = 0.7032$  V/A rad/s. the field voltage is 220 V. The back emf will be  
a. 142.97V.                      b. 138.28V.                      c. 69.14 V.                      d. 276.56 V.
- For a reverse braking operating mode of a dc motor with armature voltage,  $V_a$  and induced emf,  $E_g$   
a.  $|V_a| > |E_g|$ .                      b.  $|V_a| < |E_g|$ .                      c.  $|V_a| \leq |E_g|$ .                      d.  $|V_a| \geq |E_g|$ .
- The average field voltage for a single phase half wave converter drive is  
a.  $V = \frac{V_m}{\pi}(1 + \cos\alpha)$  for  $0 \leq \alpha \leq \pi$ .                      c.  $V = \frac{2V_m}{\pi}(1 + \cos\alpha)$  for  $0 \leq \alpha \leq \pi$ .  
b.  $V = \frac{V_m}{2\pi}(1 + \cos\alpha)$  for  $0 \leq \alpha \leq \pi$ .                      d.  $V = \frac{2m}{\pi}(1 + \cos\alpha)$  for  $0 \leq \alpha \leq \pi/2$ .
- The relationship between delay angles,  $\alpha_{a1}$  and  $\alpha_{a2}$  of two full wave converters forming a bridge between armature circuit of a dc motor in a single phase dual converter drive is  
a.  $\alpha_{a1} + \alpha_{a2} = 360^\circ$ .                      c.  $\alpha_{a1} + \alpha_{a2} = 180^\circ$ .  
b.  $\alpha_{a1} + \alpha_{a2} = 270^\circ$ .                      d.  $\alpha_{a1} + \alpha_{a2} = 90^\circ$ .
- The speed of a 20 hp, 300V, 1800 rpm separately excited dc motor is controlled by a three phase full converter drive. The field current is also controlled by a three phase full converter and set to the maximum possible value. The ac input is three phase star connected 208V, 60 Hz. the armature resistance is  $R_a = 0.25\Omega$ , the field resistance is  $R_f = 245 \Omega$ , and the motor voltage constant is  $K_v = 1.2$  V/A rad/s. The field voltage and field current are respectively  
a. 280.7 V and 1.146 A.                      c. 259.2 V and 1.146 A.  
b. 271.63 V and 1.146 A.                      d. 280.7 V and 0.573 A.
- The conditions for permissible potentials of the two voltages in a regenerative brake control of a dc-dc converters with, induced emf,  $E_g$ , supply voltage,  $V_s$ , armature current,  $I_a$  and equivalent resistance,  $R_m$  is  
a.  $0 \leq (V_s - I_a R_m) \leq E_g$ .                      c.  $0 \geq (E_g - I_a R_m) \geq V_s$ .  
b.  $V_s \leq (E_g - I_a R_m) \leq 0$ .                      d.  $0 \leq (E_g - I_a R_m) \leq V_s$ .
- A 3 phase 11.2 kW, 1750 rpm, 460V, 60 Hz, 4 pole, star connected induction motor has following parameter; Stator resistance =  $0\Omega$ , rotor resistance =  $0.38\Omega$ , stator reactance =  $1.14\Omega$ , rotor reactance =  $1.71\Omega$  and magnetizing reactance =  $33.2\Omega$ . The motor is controlled by varying the supply frequency. If the breakdown torque requirement is 35N.m, the supply frequency is  
a. 158.51 Hz.                      b. 60 Hz.                      c. 79.26 Hz.                      d. 498.01 Hz.

8. A dc chopper circuit controls the average voltage across the dc motor by
- Controlling the input voltage.
  - Controlling the field current.
  - Controlling the line current.
  - Controlling switching on and off the motor for fixed durations of  $t_{on}$  and  $t_{off}$  respectively.
9. For controlling the speed of a three phase induction motor, the method generally employed is
- Fixed voltage fixed frequency method.
  - Variable voltage fixed frequency method.
  - Fixed voltage variable frequency method.
  - Variable voltage variable frequency method.
10. Variable voltage fixed frequency method can be obtained from
- Inverter.
  - Three phase cycloconverter.
  - AC chopper.
  - DC chopper.
11. A 3 phase, 4 pole 400V, 15 kW, 1440 rpm, 50 Hz, star connected induction motor has rotor leakage impedance of  $(0.4+j1.6)\Omega$ . If this motor is energized from 120 Hz, 400V, 3 phase source, then maximum torque is
- 50 Nm.
  - 99.5 Nm.
  - 55.262 Nm.
  - 27.6 Nm.
12. A dc to dc converter is operated as buck chopper in the continuous conduction mode in steady state with a constant duty ratio,  $k$ . If  $V_{out}$  is the magnitude of the dc output voltage and  $V_{source}$  is the magnitude of dc input voltage, the ratio  $V_{out}/V_{source}$  is given by
- $k$ .
  - $1-k$ .
  - $1/1-k$ .
  - $k/1-k$ .
13. For a three phase semi-converter drive the average value of armature current for  $\alpha < 60^\circ$  and  $60^\circ < \alpha < 180^\circ$  is respectively
- $I_a$  and  $I_a^*(180-\alpha)/360$ .
  - $I_a/3$  and  $I_a^*(180-\alpha)/360$ .
  - $I_a/3$  and  $I_a^*\alpha/360$ .
  - $I_a^*(180-\alpha)/360$  and  $I_a/3$ .
14. The chopper used for on/off control of a separately excited dc motor has supply voltage of 230Vdc and on time of 10 ms and off time of 15 ms. The average load current for a motor speed of 1500 rpm and voltage constant of 0.5 V/rad per sec for armature resistance of 3 Ohm is
- 29.94 A
  - 2.2435 A.
  - 4.487 A.
  - 101.61 A.
15. The expression for the rectified voltage,  $V_D$  from the diode rectifier in static Kramer drive is
- $2.339saV_{in}$ .
  - $-2.33saV_{in}$ .
  - Zero.
  - One.
16. In comparison to salient pole motor permanent magnet synchronous motor has
- Higher pull out torque.
  - Higher efficiency.
  - Increased losses.
  - Higher pull out torque and higher efficiency.
17. The developed torque from the salient pole synchronous machine is due to
- Electromagnetic torque only.
  - Electromagnetic and reluctance torque.
  - Reluctance torque only
  - Difference of electromagnetic and reluctance torque.

18. A three phase induction motor develops a torque as a function of slip when supplied from a fixed voltage at constant frequency and operates in motoring region of operation for the following value of slip
- a.  $0 \leq s \leq 1$ .                      b.  $s < 0$ .                      c.  $1 \leq s \leq 2$ .                      d.  $s > 2$ .
19. A synchronous motor which works on a leading power factor and does not drive mechanical load is called as
- a. static condenser.                      c. synchronous condenser.  
b. condenser.                      d. static compensator.
20. The maximum power developed in a synchronous motor will depend on
- a. the rotor excitation only.  
b. the supply voltage only.  
c. the rotor excitation and supply voltage both.  
d. the rotor excitation, supply voltage and maximum value of coupling angle ( $90^\circ$ ).

