

# Unit 6 - Week 5

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## Assignment 5

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-09-04, 23:59 IST.

COMMON INSTRUCTION: PROVIDE YOUR ANSWERS ROUNDED OFF TO 2 DECIMALS PLACES.

For questions 1 to 15,

A 3-phase fully controlled converter (with an input of 400V 50 Hz) is feeding a separately excited DC motor drive of 400 V, 15 A, 1200 rpm rating. If we assume the armature resistance to be 0.5 Ω with continuous ripple free armature current,

CASE A: At rated conditions

1) What should be the firing angle in degrees

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 42.00,43.00

1 point

2) Calculate the PF

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.70,0.72

1 point

3) Calculate the DPF

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.72,0.76

1 point

4) Calculate the real power in kW

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 5.5,6.5

1 point

5) Calculate the reactive power in kVar.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 5.5,6.5

1 point

CASE B: If the load torque is reduced to half the rated value, determine the

6) Firing angle in degrees

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 41.00,43.00

1 point

7) PF

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.70,0.72

1 point

8) DPF

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.72,0.74

1 point

9) Active power in kW

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 2.9,3.1

1 point

10) Reactive power in kVar.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 2.7,3.2

1 point

CASE C: For full load torque and half the rated speed, determine the

11) Firing angle in degrees

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 67,68

1 point

12) PF

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.35,0.37

1 point

13) DPF

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.37,0.39

1 point

14) Active power in W

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 3055,3058

1 point

15) Reactive power in Var.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 7912,7917

1 point

For questions 16 to 20,

A single-phase full converter is used to control the speed of a 5 hp, 110 V, 1200 rpm, separately excited dc motor. The converter is connected to a single-phase 120 V, 50 Hz supply. The armature resistance is  $R_a = 0.2\Omega$  and armature circuit inductance is  $L_a = 5$  mH. The motor voltage constant is  $K_b = 0.09$  V/rpm. Neglect the losses in the converter.

CASE A: Rectifier (or motoring) operation. The dc machine operates as a motor, runs at 1000 rpm, and carries an armature current of 30 A. Assume that motor current is ripple-free.

16) Determine the firing angle  $\alpha$  in degrees

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 26.5,27.7

1 point

17) Determine the power to the motor in W.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 2877,2882

1 point

18) Determine the supply power factor.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.79,0.81

1 point

CASE B: Inverter operation (regenerating action). The polarity of the motor back emf is reversed, say by reversing the field excitation.

19) Determine the firing angle (in degrees) to keep the motor current at 30 A when the speed is 1000 rpm.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 140,142

1 point

20) Determine the power (in W) fed back to the supply at 1000 rpm.

No, the answer is incorrect. Score: 0

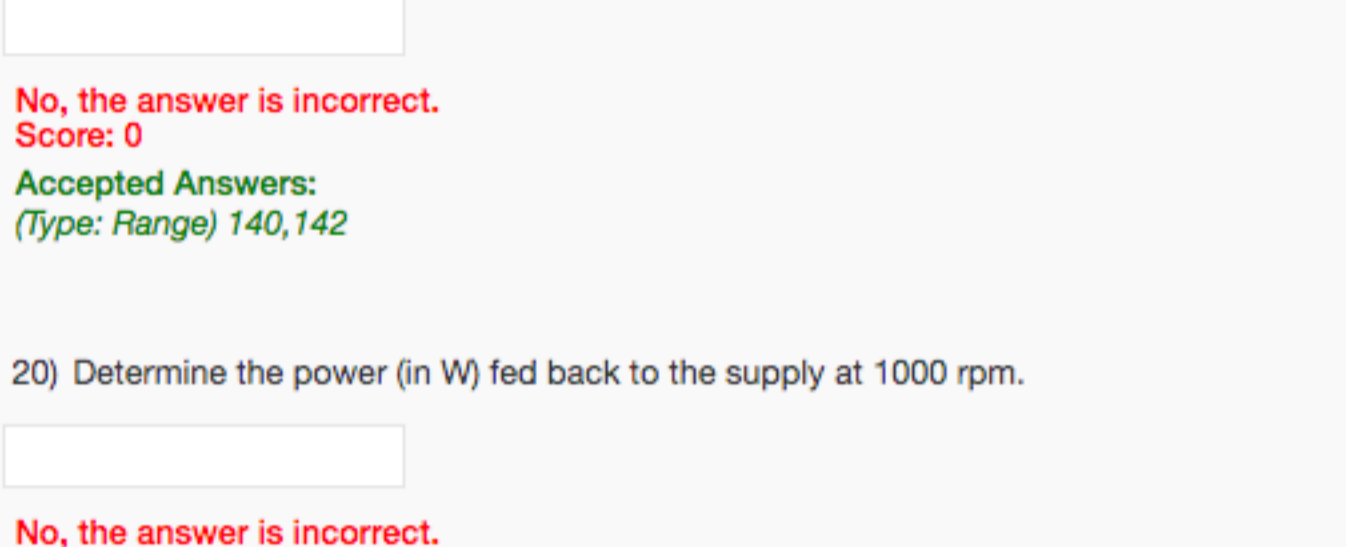
Accepted Answers: (Type: Range) 2518,2522

1 point

For questions 21 to 23,

A single phase semi-converter, shown in below figure, is used to control the speed of small separately excited dc motor rated at 4.5 kW, 220V, 1500 rpm. The converter is connected to a single phase 230 V, 50 Hz supply. The armature resistance is  $R_a = 0.50 \Omega$  and the armature circuit inductance is  $L_a = 10$  mH. The motor voltage constant is  $K_b = 0.1$  V/rpm.

With the converter operates as a rectifier, the dc motor runs at 1200 rpm and carries an armature current of 16 A. Assume that the motor current is continuous and ripple-free, determine:



21) The firing angle  $\alpha$  in degrees.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 72.5,73.5

0 points

22) The power delivered to the motor in W.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 2712,2715

0 points

23) The supply power factor.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 0.74,0.76

0 points

For questions 24 to 27,

A d.c. permanent magnet motor has the following parameters:  $R_a = 3 \Omega$ ,  $K_e = 0.52$  V/rpm.Wb,  $\Phi$  (flux per pole) = 150 mWb. The motor speed is controlled by a single phase full wave bridge rectifier. The firing angle  $\alpha$  is set at  $45^\circ$ , and the average speed is 1450 rpm. The applied phase a.c. voltage to the bridge is  $v_s = 330 \sin \omega t$  volts. Assuming the motor current is continuous;

Calculate the following armature current drawn by the motor and the steady-state torque for the cases of:

(a) Fully controlled bridge

24) Armature current drawn by the motor in A

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 11.75,11.85

1 point

25) Steady state torque in N.m.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 8.75,8.80

1 point

(b) Half-controlled (semi-converter) bridge.

26) Armature current drawn by the motor in A

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 22,23

1 point

27) Steady state torque in N.m.

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 16.3,16.5

1 point

Hint

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Range) 16.3,16.5

1 point