Middle **T**echnical **U**niversity
Electrical **E**ngineering
Technical **C**ollege
Department of **E**lectrical **P**ower
Engineering **T**echniques

Electrical **P**ower
Engineering **T**echniques
Time: **90 minutes**
Jun 2019

MSc Competitive **E**xam

Q.1

When a line-to-ground fault occurs, the current in a faulted phase is 100 A. calculate the zero sequence current.

Q.2 The following sequence currents were recorded in a power system under a fault condition $I_{positive}$=j1.753 pu, $I_{negative}$=-j0.6 pu, I_{zero}=-j1.153pu. Prove the fault is line to line ground.

Q.3 Find the following limit $lim_{x\to 0}\frac{\tan x}{x}$

Q.4 A negative feedback closed loop system is supplied an input of 5 volt. The system has a forward gain (1) and feedback gain (1). What is the output voltage?

Q.5 For flat voltage profile system, find the voltage regulation

Q.6 A transmission line has a reactance of 1 Pu is operating at V_s = V_r = 1 Pu. The generator is connected at source end which is delivering 0.5 Pu of active power. Find the load angle?

Q.7 In a type A chopper, source voltage is (100V dc). On-period is (100 μsec), off-period is (150 μsec)and load RLE consist of R =2Ω, L =5mH, and E =10V. For continues conduction what are the average output voltage and current?

Q.8 In a 3-phase half wave rectifier, if per phase input voltage is 200V, Determine the average output voltage?

Q.9 A 4-pole, long-shunt lap-wound generator supplies 25 kW at a terminal voltage of 500 V. The armature resistance is (0.03 ohm), series field resistance is (0.04 ohm) and shunt field resistance is (200 ohm). The brush drop may be taken as (1.0 V). Determine the e.m.f. generated. Calculate also the No. of conductors if the speed is (1200 r.p.m.) and flux per pole is (0.02 weber). Neglect armature reaction.

Q.10 A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50Hz. Calculate:

(i) the speed at which the magnetic field of the stator is rotating?

(ii) the speed of the rotor when the slip is 0.04?

(iii) the frequency of the rotor currents when the slip is 0.03?

(iv) the frequency of the rotor currents at standstill?

N.B. ANSWER ALL QUESTIONS

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1. Transients in electric circuits normally disappears within a time equal to

   A. 4 x time constant
   B. 8 x time constant
   C. Time constant

2. Which one of the following is correct?

   A. $X_d'' = X_d' = X_d$
   B. $X_d'' < X_d' < X_d$
   C. $X_d'' > X_d' > X_d$

3. Fault level means

   A. Voltage at the point of fault
   B. Fault current
   C. Fault MVA

4. Fault calculations using computer are usually done by

   A. Y_{bus} method
   B. Z_{bus} method
   C. Any of the above

5. the most frequently occurring fault in the power system is

   A. Single line to ground fault
   B. Double line to ground fault
   C. Symmetrical fault (3- ϕ fault)

1. $\frac{d}{dx}(\cot x)$ equals:

   A. $\csc^2 x$
   B. $-\sec^2 x$
   C. $\sec^2(-x)$
   D. $-\csc^2 x$

2. $ln(x + iy) =$

   A. $cos(x)\ cosh(y) - i\ sin(x)\ sinh(y)$
   B. $sin(x)\ cosh(y) + i\ cos(x)\ sinh(y)$
   C. $cos(x)\ cosh(y) + i\ sin(x)\ sinh(y)$
   D. $sin(x)\ cosh(y) - i\ cos(x)\ sinh(y)$

3- cos(-Θ) equals:

   A. -cos Θ
   B. cos Θ
   C. -sin Θ
   D. 0

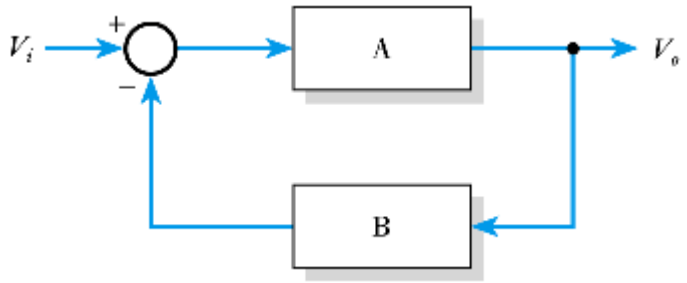
4- $\int \frac{1}{4x^2}$ dx equals

A. $\frac{1}{4x} + C$
B. $\frac{1}{2x} + C$
C. $\frac{1}{2x}$
D. $\frac{1}{8x} + C$

5- $(x-1)^3$ equals:

A. x^3-3x^2-3x-1
B. x^3-3x^2+3x-1
C. x^3-3x^2+3x+1
D. x^3+3x^2-3x-1

1. What is the voltage gain of the following arrangement?



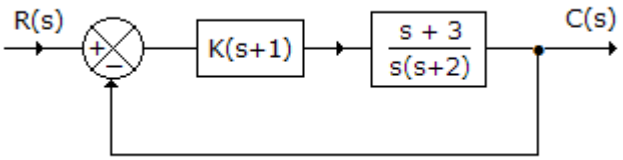
A. B/(1+AB)

B. A/(1+AB)

C. (1+AB)/B

D. (1+AB)/A

2. For the system in the given figure the characteristic equation is



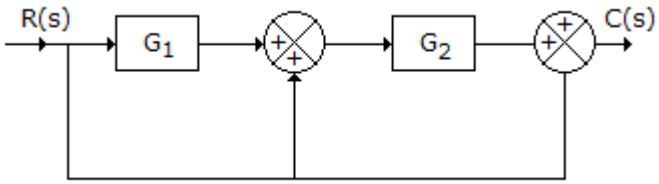
A. $1 + \frac{K(s+1)(s+3)}{s(s+2)} = 0$

B. $1 + \frac{K(s-1)(s-3)}{s(s-2)} = 0$

C. K(s + 1)(s + 3) = 0

D. s(s + 2) = 0

3. For the system in the given figure. The transfer function C(s)/R(s) is



A. $G_1 + G_2 + 1$

B. $G_1 G_2 + 1$

C. $G_1 G_2 + G_2 + 1$

D. $G_1 G_2 + G_1 + 1$

4. Whether a linear system is stable or unstable that it

A. is a property of the system only

B. depends on the input function only

C. both (a) and (b)

D. either (a) or (b)

5. For the system of the given figure the transfer function $E_o(s)/E_i(s)$=

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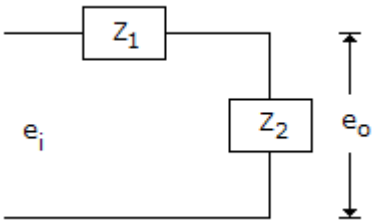

A. $\frac{Z_2(s)}{Z_1(s)}$

B. $\frac{Z_2(s)}{Z_1(s) + Z_2(s)}$

C. $\frac{Z_1(s)}{Z_2(s)}$

D. $\frac{Z_1(s)}{Z_1(s) + Z_2(s)}$

1. Advantages of higher transmission voltage is/are
A. Power transfer capability of the transmission line is increased
B. Transmission line losses are reduced
C. Area of cross section and volume of the conductor is reduced
D. all of the above

2. Maximum power transfer capability of transmission line can be increased by
A. Parallel transmission lines
B. Using series capacitance
C. Using bundled conductors
D. all of the above

3. Under over excitation synchronous phase modifier works as
A. shunt capacitor
B. series capacitor
C. shunt reactor
D. any of the above

4. Which of the following is/are advantages of N-R method?
A. Number of iterations are less
B. Applicable for large power system network
C. Time taken for each iteration is less
D. both 1 and 2

5. Bundled conductors in EHV transmission lines
   A. increase inductance
   B. increase capacitance
   C. decrease inductance
   D. decrease capacitance

1. A PWM switching scheme is used with a three-phase inverter to:
   A. Reduce the total harmonic distortion with modest filtering.
   B. Minimize the load on DC side.
   C. Increase the life of the batteries.
   D. Reduce low order harmonics and increase high order harmonics.
2. The speed and torque of induction motor can be varied by which of the following means:
   A) Stator voltage control.
   B) Rotor voltage control.
   C) Frequency control.
   D) All of these.
3. The speed of a dc motor can be controlled by varying:
   A. Its flux per pole
   B. Resistance of armature circuit
   C. Applied voltage
   D. All of the above
4. The slip power recovery method for the speed control of induction motor:
   A. Increase the efficiency.
   B. Decrease the efficiency.
   C. Improve the power factor.
   D. None of these.
5. Reluctance motor is a:
   A. Self-starting type synchronous motors
   B. Low torque variable speed motor
   C. Variable torque motor
   D. Low noise slow speed motor

1. The critical resistance of the d.c. generator is the resistance of

   A. field
   B. armature
   C. load

D. brushes

2. The purpose of a commutator in a d.c. generator is to
   A. increase output voltage
   B. reduce sparking at brushes
   C. provide smoother output
   D. convert the induced a.c. into d.c.

3. Between no-load and full-load, ... motor develops the least torque
   A. shunt
   B. cumulative compound
   C. series
   D. differential compound

4. What is the mechanical power developed by a DC series motor is maximum?
   A. Back emf is equal to zero
   B. Back emf is equal to half the applied voltage
   C. Back emf is equal to one third to the applied voltage
   D. Back emf is equal to applied voltage

5. Which of the following motor has negative speed regulation?
   A. Shunt motor
   B. Series motor
   C. Cumulative compound motors
   D. Differential compound motor