Gate Mock Test Questions(2014-2015)

1	The open loop transfer function of a unity feed back control system is given as

$$G(s) = \frac{as + 1}{s^2}$$

The value of 'a' to give a phase margin of 45° is equal to

Options
   A) 0.141 **B)** 0.441
   C) 0.841 **D)** 1.141

Correct Answer   C

2   The armature resistance of a permanent magnet dc motor is 0.8 W. At no load, the motor draws 1.5 A from a supply voltage of 25 V and runs at 1500 rpm. The efficiency of the motor while it is operating on load at 1500 rpm drawing a current of 3.5 A from the same source will be

Options
   A) 48.0% **B)** 57.1%
   C) 59.2% **D)** 88.8%

Correct Answer   A

3   The solution of the first order differential equation $x(t) = -3x(t)$, $x(0) = x_0$ is
Options
   A) $x(t) = x_0 e^{-3t}$ **B)** $x(t) = x_0 e^{-3}$
   C) $x(t) = x_0 e^{-1/3}$ **D)** $x(t) = x_0 e^{-1}$

Correct Answer   A

4   The unit impulse response of a second order under-damped system starting from rest is given by $c(t) = 12.5 \, e^{-6t} \sin 8 t$, $t \geq 0$ The steady-state value of the unit step response of the system is equal to

Options
   A) 0   **B)** 0.25
   C) 0.5 **D)** 1.0

Correct Answer   D

5   A single-phase, 230 V, 50 Hz, 4 pole, capacitor-start induction motor has the following stand-still impedances Main winding $Z_m = 6.0 + j4.0 \, \Omega$ Auxiliary winding $Z_a = 8.0 + j6.0 \, \Omega$. The value of the starting capacitor required to

produce 90° phase difference between the currents in the main and auxiliary windings will be

Options
A) 176.84 μF **B)** 187.24 μF
C) 265.26 μF **D)** 280.86 μF

Correct Answer   A

6   A single-phase half-controlled rectifier is driving a separately excited dc motor. The dc motor has a back emf constant of 0.5 V/rpm. The armature current is 5 A without any ripple. The armature resistance is 2Ω . The converter is working from a 280 V, single phase ac source with a firing angle of 80°. Under this operating condition, the speed of the motor will be

Options
A) 339 rpm **B)** 359 rpm
C) 366 rpm **D)** 386 rpm

Correct Answer   C

7   The 8085 assembly language instruction that stores the content of H and L registers into the memory locations 2050_H and 2051_H, respectively, is

Options
A) SPHL 2050_H **B)** SPHL2051_H
C) SHLD 2050_H **D)** STAX 2050_H

Correct Answer   C

8   A 50 Hz, 4-pole, 500 MVA, 22 kV turbo-generator is delivering rated megavolt-amperes at 0.8 power factor. Suddenly a fault occurs reducing is electric power output by 40%. Neglect losses and assume constant power input to the shaft. The accelerating torque in the generator in MNm at the time of the fault will be

Options
A) 1.528 **B)** 1.018
C) 0.848 **D)** 0.509

Correct Answer   A

9   The Nyquist plot of loop transfer function G(s) H(s) of a closed loop control system passes through the point (-1, j0) in the G(s) H(s) plane. The phase margin of the system is

Options
A) 0° **B)** 45°
C) 90° **D)** 180°

Correct Answer   D

10   A 50 kW dc shunt motor is loaded to draw rated armature current at any given speed. When drive.

(i) at half the rated speed by armature voltage control and (ii) at 1.5 times the rated speed by field control, the respective output powers delivered by the motor are approximately.

Options

A) 25kW in (i) and 75kW in (ii)   **B)** 25kW in (i) and 50kW in (ii)

C) 50kW in (i) and 75kW in (ii)   **D)** 50kW in (i) and 50kW in (ii)

Correct Answer   B

11   A hydraulic turbine having rated speed of 250 rpm is connected to a synchronous generator. In order to produce power at 50 Hz, the number of poles required in the generator are

Options

A) 6   **B)** 12

C) 16 **D)** 24

Correct Answer   D

12   For the equation $x(t)+3\,x(t)+2x(t)=5$, the solution x (t) approaches which of the following values as t □ □ ?

Options

A) 0   **B)** $\frac{5}{2}$

C) 5 **D)** 10

Correct Answer   B

13   The following motor definitely has a permanent magnet rotor
Options
A) DC commutator motor **B)** Brushless dc motor

C) Stepper motor   **D)** Reluctance motor

Correct Answer   C

14   A110 kV, single core coaxial, XLPE insulated power cable delivering power at 50Hz, has a capacitance of 125 nF/km. If the dielectric loss tangent of XLPE is 2 x 10^{-4}, the dielectric power loss in this cable in W/km is

Options

A) 5.0   **B)** 31.7

C) 37.8 **D)** 189.0

Correct Answer   D

15   The simultaneous application of signals x(t) and y(t) to the horizontal and vertical plates, respectively, of an oscilloscope, produces a vertical figure-of-8 display. If P and Q are constants, and x(t) = P sin (4t + 30), then y(t) is equal to

Options	**A)** Q sin (4t - 30) **B)** Q sin (2t + 15)
	C) Q sin (8t + 60) **D)** Q sin (4t + 30)

Correct Answer	B

16
A 500 MW 3-phase Y-connected synchronous generator has a rated voltage of 21.5 kV at 0.85pf. The line current when operating at full load rated conditions will be

Options
A) 13.43 kA **B)** 15.79 kA
C) 23.25 kA **D)** 27.36 kA

Correct Answer	B

17
Total instantaneous power supplied by a 3-phase ac supply to a balanced R-L load is

Options
A) zero   **B)** constant
C) pulsating with zero average **D)** pulsating with non-zero average

Correct Answer	B

18
The equivalent circuit of a transformer has leakage reactances X_1 , X

Options
A) $X_1 >> X$ **B)** $X_1 << X$
C) $X_1 \square$ X **D)** $X_1 \square$ X

Correct Answer	D

19
If P and Q are two random events, then the following is TRUE

Options
A) Independence of P and Q implies that **B)** Probability (P ∪ Q) ≥ probability (P Q) = 0   Probability (P) + Probability (Q)
C) If P and Q are mutually exclusive, then **D)** Probability (P ∩ Q) ≤ they must be independent   Probability (P)

Correct Answer	D

20
A digital-to-analog converter with a full-scale output voltage of 3.5 V has a resolution close to 14m V. Its bit size is

Options
A) 4   **B)** 8
C) 16 **D)** 32

Correct Answer	B

21
A single-phase half-controlled rectifier is driving a separately excited dc motor. The dc motor has a back emf constant of 0.5 V/rpm. The armature current is 5 A

without any ripple. The armature resistance is $2\,\Omega$. The converter is working from a 280 V, single phase ac source with a firing angle of 80°. Under this operating condition, the speed of the motor will be

Options

A) 339 rpm **B)** 359 rpm

C) 366 rpm **D)** 386 rpm

Correct Answer   C

22   In relation to the synchronous machines, which one of the following statements is false?

Options   **A)** In salient pole machines, the direct-axis synchronous reactance is greater **B)** The damper bars help the than the quadrature-axis synchronous synchronous motor self start reactance

C) Short circuit ratio is the ratio of the **D)** The V-curve of a synchronous motor field current required to produce the represents the variation in the armature rated voltage on open circuit to the current with field excitation, at a given rated armature current   output power

Correct Answer   C

23   The 8085 assembly language instruction that stores the content of H and L registers into the memory locations 2050_H and 2051_H, respectively, is

Options   **A)** SPHL 2050_H **B)** SPHL2051_H

C) SHLD 2050_H **D)** STAX 2050_H

Correct Answer   C

24   If $\bar{E}$ is the electric field intensity, $\nabla \cdot (\nabla \times \bar{E})$ is equal to

Options   **A)** $\bar{E}$ **B)** $|\bar{E}|$

C) null vector **D)** zero

Correct Answer   D

25   For the function $f(x) = x^2\, e^{-x}$, the maximum occurs when x is equal to

Options   **A)** 2 **B)** 1

C) 0 **D)** -1

Correct Answer   B

26   Two wattmeters, which are connected to measure the total power on a three - phase system supplying a balanced load, read 10.5 kW and - 2.5 kW, respectively. The total powere and the power factor, respectively, are

Options   **A)** 13.0 kW, 0.334 **B)** 13.0 kW, 0.684

      C) 8.0 kW, 0.52   **D)** 8.0 kW, 0.334

Correct Answer   D

27   The insulation strength of an EHV transmission line is mainly governed by

Options   **A)** load power factor **B)** switching over-voltages

      C) harmonics   **D)** corona

Correct Answer   B

28   For the equation,
$$s^3 - 4s^2 + s + 6 = 0$$
the number of roots in the left half of s-plane will be

Options   **A)** zero **B)** one

      C) two **D)** three

Correct Answer   C

29   A dc potentiometer is designed to measure up to about 2 V with a slide wire of 800 mm. A standard cell of emf 1.18 V obtains balance at 600 mm. A test cell is seen to obtain balance at 680 mm. The emf of the test cell is

Options   **A)** 1.00V **B)** 1.34V

      C) 1.50V **D)** 1.70V

Correct Answer   B

30   High Voltage DC (HVDC) transmission is mainly used for

Options   **A)** bulk power transmission over very long distances **B)** inter-connecting two systems with the same nominal frequency

      C) eliminating reactive power requirement in the operation **D)** minimizing harmonics at the converter stations

Correct Answer   A

31   A bipolar junction transistor (BJT) is used as a power control switch by biasing it in the cut-off region (OFF state) or in the saturation region (ON state). In the ON state, for the BJT

Options

A) both the base-emitter and base-collector junctions are reverse biased

B) the base-emitter junction is reverse biased, and the base-collector junction is forward biased

C)

the base-emitter junction is forward biased, and the base-collector junction is reverse biased

D) both the base-emitter and base-collector junctions are forward biased

Correct Answer   D

31   The Q - meter works on the principle of
Options   **A)** mutual inductance **B)** self inductance
                        C) series resonance   **D)** parallel resonance

Correct Answer   C

32   A 800 kV transmission line is having per phase line inductance of 1.1 mH/km and per phase line capacitance of 11.68 nF/km. Ignoring the length of the line, its ideal power transfer capability in MW is
Options   **A)** 1204 MW **B)** 1504 MW
                        C) 2085 MW **D)** 2606 MW

Correct Answer   C

33   If the following program is executed in a icroprocessor, the number of instruction cycles it will take from START to HALT is

```
START MVI A, 14H ; Move 14H to register A
SHIFT  RLC          ; Rotate left without carry
       JNZ SHIFT ; Jump on non-zero to SHIFT
       HALT
```

Options   **A)** 4 **B)** 8
                        C) 13 **D)** 16

Correct Answer   C

34   A moving iron ammeter produces a full scale torque of 240 ⬜ Nm with a deflection of 120° at a current of 10 A. The rate of change of self inductance (⬜ H/radian) of the instrument at full scale is
Options   **A)** 2.0 ⬜ H/radian   **B)** 4.8 ⬜ H/radian
                        C) 12.0 ⬜ H/radian   **D)** 114.6 ⬜ H/radian

35   At an industrial sub-station with a 4 MW load, a capacitor of 2 MVAR is installed to maintain the load power factor at 0.97 lagging. If the capacitor goes out of serivce, the load power factor becomes

Options   **A)** 0.85   **B)** 1.00

                 C) 0.80 lag **D)** 0.90 lag

Correct Answer   C

36   The conduction loss versus device current characteristic of a power MOSFET is best approximated by

Options   **A)** a parabola   **B)** a straight line

                 C) a rectangular hyperbola **D)** an exponentially decaying function

Correct Answer   A

37   If P and Q are two random events, then the following is TRUE

Options   **A)** Independence of P and Q implies that **B)**   Probability $(P \cup Q) \geq$ probability $(P \cap Q) = 0$ Probability (P) + Probability (Q)

                 C) If P and Q are mutually exclusive, then **D)**   Probability $(P \cap Q) \leq$ they must be independent   Probability (P)

Correct Answer   D

38   A 50 kW dc shunt motor is loaded to draw rated armature current at any given speed.   When   driven (i) at   half   the   rated   speed   by   armature   voltage   control   and (ii) at 1.5 times the rated speed by field control, the respective output powers delivered by the motor are approximately.

Options   **A)** 25kW in (i) and 75kW in (ii)   **B)** 25kW in (i) and 50kW in (ii)

                 C) 50kW in (i) and 75kW in (ii)   **D)** 50kW in (i) and 50kW in (ii)

Your Answer   (Not Answered)

Correct Answer   B

39   A fair coin is tossed three times in succession. If the first toss poduces a head, then the probability of getting exactly two heads in three tosses is

Options   **A)** **B)**

                 $\dfrac{1}{8}$ $\dfrac{1}{2}$

                 C) **D)**

                 $\dfrac{3}{8}$ $\dfrac{3}{4}$

Correct Answer   D

40   In the matrix equation Px = q, which of the following is a necessary condition for the existence of at least one solution for the unknown vector x:

Options   **A)** Augmented matrix [Pq] must have the same rank as matrix P

B) Vector q must have only non-zero elements

C) Matrix P must be singular

D) Matrix P must be square

Correct Answer   A

41   At an industrial sub-station with a 4 MW load, a capacitor of 2 MVAR is installed to maintain the load power factor at 0.97 lagging. If the capacitor goes out of serivce, the load power factor becomes

Options   **A)** 0.85   **B)** 1.00

C) 0.80 lag **D)** 0.90 lag

Correct Answer   C

42   In the GH(s) plane, the Nyquist plot of the loop transfer function G(s)H(s) =

$$\square \frac{e^{-0.25}}{s}$$

asses through the negative real axis at the point

Options   **A)** (-0.25, j0) **B)** (-0.5, j0)

C) (-1, j0)   **D)** (-2, j0)

Correct Answer   B

43   If S =

$$\square \int_{1}^{\square} x^{-3} \, dx,$$ then S has the value

Options   **A)** $\frac{-1}{3}$ **B)** $\frac{1}{4}$

C) $\frac{1}{2}$ **D)** 1

Correct Answer   C

44   The following motor definitely has a permanent magnet rotor
Options   **A)** DC commutator motor **B)** Brushless dc motor

C) Stepper motor   **D)** Reluctance motor

Correct Answer   C

45   The conduction loss versus device current characteristic of a power MOSFET is best approximated by

Options   **A)** a parabola   **B)** a straight line

C) a rectangular hyperbola **D)** an exponentially decaying function

Correct Answer   A

46   A digital-to-analog converter with a full-scale output voltage of 3.5 V has a resolution close to 14m V. Its bit size is

Options   **A)** 4   **B)** 8

C) 16 **D)** 32

Correct Answer   B

47   A 50 Hz, bar primary CT has a secondary with 500 turns. The secondary supplies 5 A current into a purely resistive burden of l W. The magnetizing ampere-turns is 200. The phase angle between the primary and secondary current is

Options   **A)** 4.6°   **B)** 85.4°

C) 94.6° **D)** 175.4°

Correct Answer   A

48   The armature resistance of a permanent magnet dc motor is 0.8 W. At no load, the motor draws 1.5 A from a supply voltage of 25 V and runs at 1500 rpm. The efficiency of the motor while it is operating on load at 1500 rpm drawing a current of 3.5 A from the same source will be

Options   **A)** 48.0% **B)** 57.1%

C) 59.2% **D)** 88.8%

Correct Answer   A

49   A bipolar junction transistor (BJT) is used as a power control switch by biasing it in the cut-off region (OFF state) or in the saturation region (ON state). In the ON state, for the BJT

Options

A) both the base-emitter and base-collector junctions are reverse biased

B) the base-emitter junction is reverse biased, and the base-collector junction is forward biased

C)

D) both the base-emitter and base-collector junctions are forward biased

the base-emitter junction is forward biased, and the base-collector junction is reverse biased

Correct Answer   D

50   For   the   equation,
                          s^3 - $4s^2+$ s   +   6   =   0
                          the number of roots in the left half of s-plane will be

Options   **A)** zero **B)** one
                          C) two **D)** three

Correct Answer   C