1.Let $f(x) = x e^{-x}$. The maximum value of the function in the interval $(0, \infty)$ is
(A) e^{-1} (B) e   (C) $1 - e^{-1}$ (D) $1 + e^{-1}$

2. $x(t)$ is nonzero only for $T_x < t < T'_x$, and similarly, $y(t)$ is nonzero only for $T_y < t < T'_y$.
Let $z(t)$ be convolution of $x(t)$ and $y(t)$. Which one of the following statements is TRUE?

(A) $z(t)$ can be nonzero over an unbounded interval.
(B) $z(t)$ is nonzero for $t < T_x + T_y$.
(C) $z(t)$ is zero outside of $T_x + T_y < t < T'_x + T'_y$.
(D) $z(t)$ is nonzero for $t > T'_x + T'_y$.

3.For a periodic square wave, which one of the following statements is TRUE?

A)The Fourier series coefficients do not exist.
B)The Fourier series coefficients exist but the reconstruction converges at no point.
C)The Fourier series coefficients exist and the reconstruction converges at most points.
D)The Fourier series coefficients exist and the reconstruction converges at every point.

4. An 8-pole, 3-phase, 50 Hz induction motor is operating at a speed of 700 rpm. The frequency of therotor current of the motor in Hz is_____.

5.The undesirable property of an electrical insulating material is

(A) high dielectric strength   (B) high relative permittivity
(C) high thermal conductivity   (D) high insulation resistivity

6.For a specified input voltage and frequency, if the equivalent radius of the core of a transformer is reduced by half, the factor by which the number of turns in the primary should change to maintainthe same no load current is

(A) 1/4   (B) 1/2   (C) 2   (D) 4

7.In the formation of Routh-Hurwitz array for a polynomial, all the elements of a row have zero values. This premature termination of the array indicates the presence of

(E) only one root at the origin   (B) imaginary roots
(C) only positive real roots   (D) only negative real roots

8.In an oscilloscope screen, linear sweep is applied at the

(A) vertical axis   (B) horizontal axis
(C) origin   (D) both horizontal and vertical axis

9.A cascade of three identical modulo-5 counters has an overall modulus of

(A) 5   (B) 25   (C) 125   (D) 625

10.In an unbalanced three phase system, phase current $I_a = 1\angle(-90^0)$ pu, negative sequence current $I_{b2} = 4\angle(-150^0)$ pu, zero sequence current $I_{c0} = 3\angle90^0$ pu. The magnitude of phase current I_b in pu is

(A) 1.00   (B) 7.81   (C) 11.53   (D) 13.00

11.The core loss of a single phase, 230/115 V, 50 Hz power transformer is measured from 230 V side by feeding the primary (230 V side) from a variable voltage variable frequency source while keeping the secondary open circuited. The core loss is measured to be 1050 W for 230 V, 50 Hz input. The core loss is again measured to be 500 W for 138 V, 30 Hz input. The hysteresis and eddy current losses of the transformer for 230 V, 50 Hz input are respectively,

(A) 508 W and 542 W.   (B) 468 W and 582 W.
(C) 498 W and 552 W.   (D) 488 W and 562 W.

12.A 3 phase, 50 Hz, six pole induction motor has a rotor resistance of 0.1 Ω and reactance of 0.92 Ω. Neglect the voltage drop in stator and assume that the rotor resistance is constant. Given that the full load slip is 3%, the ratio of maximum torque to full load torque is

(A) 1.567   (B) 1.712   (C) 1.948   (D) 2.134

13.The dc current flowing in a circuit is measured by two ammeters, one PMMC and another electrodynamometer type, connected in series. The PMMC meter contains 100 turns in the coil, the flux density in the air gap is 0.2 Wb/m², and the area of the coil is 80 mm². The electrodynamometer ammeter has a change in mutual inductance with respect to deflection of 0.5 mH/deg. The spring constants of both the meters are equal. The value of current, at which the deflections of the two meters are same, is _____

14.What is the average of all multiples of 10 from 2 to 198?

(A) 90   (B) 100   (C) 110   (D) 120

15.While measuring power of a three-phase balanced load by the two-wattmeter method, the readingsare 100 W and 250 W. The power factor of the load is_____.

16.Which of the following is an invalid state in an 8-4-2-1 Binary Coded Decimal counter
    (A) 1 0 0 0   (B) 1 0 0 1   (C) 0 0 1 1   (D) 1 1 0 0

17.A step-up chopper is used to feed a load at 400 V dc from a 250 V dc source. The inductor currentis continuous. If the 'off' time of the switch is 20 μs, the switching frequency of the chopper in kHzis_.

18. For a single phase, two winding transformer, the supply frequency and voltage are both increased by 10%. The percentage changes in the hysteresis loss and eddy current loss, respectively, are

    (A) 10 and 21   (B) —10 and 21   (C) 21 and 10   (D) —21 and 10

19. A synchronous generator is connected to an infinite bus with excitation voltage E_f = 1.3 pu. The generator has a synchronous reactance of 1.1 pu and is delivering real power (P) of 0.6 pu to the bus. Assume the infinite bus voltage to be 1.0 pu. Neglect stator resistance. The reactive power (Q) in pu supplied by the generator to the bus under this condition is_____.

20.There are two generators in a power system. No-load frequencies of the generators are 51.5 Hz and 51 Hz, respectively, and both are having droop constant of 1 Hz/MW. Total load in the system is
2.5 MW. Assuming that the generators are operating under their respective droop characteristics, the frequency of the power system in Hz in the steady state is------------