1.Find the total charge inside the volumes indicated

$\rho v = 10 z^2 e^{-0.1x} \sin \Pi y$, $-1 \le x \le 2$, $0 \le y \le 1$, $3 \le z \le 3.6$

a. 100 C b. 119.478 c. 150 C d. 50 C

2. Four infinite uniform sheets of charge are located as follows : 20 pC/m^2 at y = 7, -8 pC/m^2 at y = 3, 6 pC/m^2 at y = -1, and -18 pC/m^2 at y = -4 . Find $\bar{E}$ at the point P_A(2,6,-4)

a.1 $\bar{a}_y$ V/m b. 2 $\bar{a}_y$ V/m c. -2.259$\bar{a}_y$ V/m d. 3$\bar{a}_y$ V/m

3.A point charge ,Q_1= 10 μC, is located at P_1(1,2,3) in free space , while Q_2 = -5μC is at P_2(1,2,10).Find the vector force exerted on Q_2 by Q_1

a.1$\bar{a}_z$ mN b.0.5$\bar{a}_z$ mN c. 1.5$\bar{a}_z$ mN d. -1.834 $\bar{a}_z$ mN

4.A 5 –nC point charge is located at A(2,-1,-3) in free space .Find $\bar{E}$ at the origin

a.1.716$\bar{a}_x$ +0.858 $\bar{a}_y$+2.574 $\bar{a}_z$V/m, b.0 c.∞ d. insufficient data

5.Eight point charges of 1 nC each are located at the corners of a cube in free space that is 1 m on a side .Find $|\bar{E}|$ at the centre of the cube

a. zero b. ∞ c.0.5 d.1

6.A sheet of charge , ρ_s = 2 nC/m^2, is present at the plane x =3 in free space , and a line charge, ρ_L = 20 nC/m, is located at x =1, z =0.4. Find the magnitude of the electric field intensity at the origin

a. 100 V/m b. 158.543 V/m c. 200 V/m d. 50 V/m

7.Find a numerical value for the divergence of $\bar{D}$ at the point indicated if

$\bar{D} = 20xy^2(z+1)\bar{a}_x + 20x^2y(z+1)\bar{a}_y + 10x^2y^2\bar{a}_z$ C/m^2 at P_A(0.3,0.4,0.5)

a.2.5 C/m^3 b. 5 C/m^3 c. 7.5 C/m^3 d. 10 C/m^3

Questions 8 and 9 are Common data Questions

The spherical surfaces r = 1,2 and 3 carry surface charge densities of 20,-9, and 2 nC/m^2, respectively

8. How much electric flux leaves the surface r =5 ?

a.10 nC b. 5 nc c. 20 nC d. 25.1327 nC

9.Find $\bar{D}$ at P(1,-1,2)

a.-2.667 $\bar{a}_r$ nC/m^2 b. 5 $\bar{a}_r$ nC/m^2 c. 10 $\bar{a}_r$ nC/m^2 d. 15 $\bar{a}_r$ nC/m^2

10.Given the potential field V = 100 √r V in free space, find : $\bar{E}, \bar{D}$

a.(-50/√r) $\bar{a}_r$ V/m, 0 C/m^2 b. (-50/√r) $\bar{a}_r$ V/m, (-50Є$_0$/√r) $\bar{a}_r$ C/m^2 c. 0, (-50Є$_0$/√r) $\bar{a}_r$ C/m^2 d. 0,0

Questions 11,12 are common data questions

The region y < 0 contains a dielectric material for which $Є_{R1}$ =2.5 , while the region y>0, is characterized by $Є_{R2}$ =4, Let $\bar{E}_1 = -30\bar{a}_x + 50\bar{a}_y + 70\bar{a}_z$

11.Find E_{N1}

a. 10 V/m b. 20 V/m c. 50 V/m d. 0

12. Find E_{t1}

a. 0 b. 20 V/m c. 10 V/m d. 76.158 V/m

13.Find the relative permittivity of the dielectric material used in a parallel plate capacitor if:

(a) C= 40 nF, d = 0.1 mm, and S=0.15 m^2; (b) d = 0.2 mm, E = 500 kV/m, and ρ_s = 10 μC/m^2

#56,2nd floor, 22nd main, JP Nagar, 2nd phase, Bangalore-560 078.
Ph. 97419 00225/080 32491693 ies4techies@gmail.com
www.instituteofengineeringstudies.com

a.3.012, 2.259 b. 1,2 c. 2,3 d. 1,3

14. Find the relative permittivity of the dielectric material used in a parallel plate capacitor if: D = 50 μC/m^2 and the energy density is 20 J/m^3

a.2 b. 7.059 c.5 d. 0

15.Find $\bar{H}$ at P(2,3,5) in Cartesian coordinates if there is an infinitely long current filament passing through the origin and point C. The current of 50A is directed from the origin to C, where the location of C is : C(0,0,1)

a.1.224 $\bar{a}_x$+ 5 $\bar{a}_y$ A/m b. 2 $\bar{a}_x$+ 3 $\bar{a}_y$ A/m c. 1.224 $\bar{a}_x$+1.836 $\bar{a}_y$ A/m d.0

16. Find $\bar{H}$ at P(2,3,5) in Cartesian coordinates if there is an infinitely long current filament passing through the origin and point C. The current of 50A is directed from the origin to C, where the location of C is : C(0,1,0)

a.2$\bar{a}_x$- 1$\bar{a}_z$ A/m b. 5$\bar{a}_x$- 4$\bar{a}_z$ A/m c. 0.5$\bar{a}_x$- 0.1$\bar{a}_z$ A/m d. 1.372$\bar{a}_x$- 0.549$\bar{a}_z$ A/m

17.For sea water with σ = 5 mhos/m and ϵ_r = 80, μ = μ_0 find the distance a radio signal can be transmitted at 25 Kcps and 25 Mcps if the range is taken to be the distance at which 90 % of the wave amplitude is attenuated

a.10 cm b.5 cm c. 20 cm d. 15 cm

18.A sinusoidal plane wave is transmitted through a medium whose breakdown strength is 30 KV/m rms and whose relative permittivity is 4. Determine the mean possible power flow density and the peak value of the associated magnetizing force

a.2000 kW/m^2, 0.2 A/m b. 2390 kW/m^2, 0.112 A/m c. 1590 kW/m^2, 0.9 A/m
d. 1200kW/m^2, 0.8 A/m

19.Find the reflection coefficient and the transmission coefficient of an electric field wave traveling in air and incident normally on a boundary between air and a dielectric having permeability = μ_0 and permittivity ϵ_r =4

a.1/2, 1/3 b. ¼, 1/6 c. -1/3, 2/3 d. 4/3, 5/3

20.A plane wave propagating through a medium [e_r = 8, μ_r =2, and σ = 0] has its electric field is given by $\vec{E}$ = 0.5 $e^{-(z/3)}$ sin(10^8t – βz) V/m. The wave impedance, in ohms is

a. 377 b. $198.5\angle 180^0$ c. $182.9\angle 14^0$ d.188.3

21.The magnitudes of the open-circuit and short-circuit input impedances of a transmission line are 100 Ω and 25 Ω respectively . The characteristic impedance of the line is,

a.25 Ω b. 50 Ω c. 75 Ω d. 100 Ω

22.A material has conductivity of 10^{-2} mho/m and a relative permittivity of 4. The frequency at which the conduction current in the medium is equal to the displacement current is

a.45 MHz b. 90 MHz c. 450 MHz d. 900 MHz

23.An air-filled rectangular waveguide has inner dimensions of 3 cm x 2 cm . The wave impedance of the TE_{20} mode of propagation in the waveguide at a frequency of 30 GHz is (free space impedance η_0 = 377 Ω)

a.308 Ω b. 355 Ω c. 400 Ω d. 461 Ω

24.A rectangular waveguide of internal dimensions(a = 4 cm and b = 3 cm) is to be operated in TE_{11} mode. The minimum operating frequency is

a.6.25 GHz b. 6.0 GHz c. 5.0 GHz d. 3.75 GHz

25.At 20 GHz, the gain of a parabolic dish antenna of 1 meter diameter and 70% efficiency is

a.15 dB b. 25 dB c. 35 dB d. 45 dB

26.W_1 is the electrostatic energy stored in a system of three equal point charges arranged in a line with 0.5 m separation between them . If W_2 is the energy stored with 1 m separation between them , then which one of the following is correct ?

a.$W_1 = 0.5\ W_2$ b. $W_1 = W_2$ c. $W_1 = 2\ W_2$ d. $W_1 = 4\ W_2$

27.When the reflection coefficient equals $1\angle 0^0$ What is the VSWR ?

a. zero b. 1 c. 3 d. infinite

28.A 5 A current enters a right circular cylinder of 5 cm radius. What is the linear surface current density at the end surface ?

a.(50/π) A/m b. (100/π) A/m c. (1000/π) A/m d. (2000/π) A/m

29.A lossless transmission line of characteristic impedance Z_0 and length l< λ<4 is terminated at the load end by an open circuit. What is its input impedance Z_s ?

a. $Z_s = j\ Z_0 \tan \beta l$ b. $Z_s = j\ Z_0 \cot \beta l$ c. $Z_s = -j\ Z_0 \tan \beta l$ d. $Z_s = -\ j\ Z_0 \tan \beta l$

30.As the aperture area of an antenna increases , its gain

a. increases b. decreases c. remains steady d. behaves unpredictably

Key:

1.b	2.c	3.d	4.a	5.a	6.b	7.c	8.d	9.a	10.b	11.c	12.d
	13.a	14.b	15.c	16.d	17.a	18.b	19.c	20.d	21.b	22.a	23.c
	24.a	25.d	26.c	27.d	28.a	29.d	30.a				