GANPAT UNIVERSITY
U. V. PATEL COLLEGE OF ENGINEERING
B.TECH. SEM-I
2ES103: BASIC OF ELECTRICAL ENGINEERING
CH. 2 CAPACITOR
5: ASSIGNMENT &TUTORIAL

Part – I Multiple Objective Questions (MCQ)

1. A parallel plate capacitor has an electrode area of 100 mm2, with spacing of 0.1 mm between the electrodes. The dielectric between the plates is air with a permittivity of 8.85×10^{-12} F/m. The charge on the capacitor is 100 V. The stored energy in the capacitor is

A) 8.85 pJ **B)** 440 pJ
C) 22.1 nJ **D)** 44.3 nJ

2. The capacitance of a capacitor is not influenced by

A) Plate thickness **B)** Plate area
C) Plate separation **D)** Nature of dielectric

3. A capacitor carries a charge of 0.1 C at 5 V. Its capacitance is

A) 0.02 F **B)** 0.5 F
C) 0.05 F **D)** 0.2 F

4. A 10 µF, 20 µF , 22 µF , and 100 µF capacitor are in parallel. The total capacitance is

A) 2.43 µF **B)** 4.86 µF
C) 100 µF **D)** 152 µF

5. Five capacitors each of 5 µF are connected in series, the equivalent capacitance of the system will be

A) 5 µF **B)** 25 µF
C) 10 µF **D)** 1 µF

6. To obtain a high value of capacitance, the permittivity of dielectric medium should be

A) Low **B)** Zero
C) High **D)** Unity

7. When the plate area of a capacitor increases,

A) the capacitance increases **B)** the capacitance decreases
C) the capacitance is unaffected **D)** The voltage it can withstand increases.

8. The energy stored in an electric field is given by the expression.

A) $\frac{1}{2}CV^2$ **B)** $\frac{1}{2}CV$
C) $\frac{1}{2}C^2V$ **D)** $\frac{C}{2V}$

9. Joules/coulomb is the unit of

A) Electric field potential **B)** Potential
C) Charge **D)** None of the above

10. 1 F is theoretically equal to

A) 1 ohm of resistance **B)** Ratio of 1 V to 1 C
C) Ratio of 1 C to 1 V **D)** None of these

Part – II Shorts Questions **(1 & 2 Marks)**

1. What is time constant? What is the unit of time constant?
2. Define Following Terms:
   - (i) Electric Field
   - (ii) Electric Flux Density
   - (iii) Permittivity
   - (iv) Electric Field Intensity
   - (v) Potential Gradient
3. Why series resistance is connected during charging and discharging?
4. Only write the equation of capacitance of a parallel plate capacitor.
5. Define a capacitance.

Part – III Examples

1. A capacitor is consisting of two circular plates each of 200 cm^2 area and separated by 1 mm thick dielectric. Its capacitance is of 4.5 X 10^{-4} µF. When a p.d. of 15 kV is applied, calculate the electric flux density and the dielectric constant.

   Ans: D = 3.375 x 10^{-4} c/m^2, ε_r = 2.54
2. Three capacitors of capacitances 10 µF, 25 µF and 50 µF are connected (a) in series (b) in parallel. Find the equivalent capacitances and the energy stored for each of the cases, when p.d. 500 V is applied.

   Ans: C = 85 µF, W = 10.625 joules
3. Capacitor of 50 µF in series with 100 Ω resistor is suddenly connected across 100 V DC supply. Find (i) time constant of the circuit (ii) initial current (iii) current equation as a function of time (iv) voltage across resistor after 6ms.

   Ans: (i) λ = 5ms (ii) I_m = 1 A (iii) i = e^{-200t} A (iv) V_R = 30.12 V
4. A capacitor of 2 µF is charged through a resistor of 500k connected in series with it across a 500 V dc supply. Determine the voltage to which the capacitor is charged when the charging current has decreased to 80 % of its initial value.

   Ans: V = 98.75 V

Part – III Long Questions **(Only For Preparation)**

1. Derive an expression for the energy stored in a capacitor of C farads when charged to a potential difference of V volts.
2. Explain multiplate capacitor.
3. Capacitance of parallel plate capacitor with composite medium.
4. Derive equation for charging of capacitor in RC circuit. Also define time constant of circuit.

***Notes: Students have to write only Part I, Part II and Part III.**