

Duration: 2 $\frac{1}{2}$ Hrs.

Total Marks: 60

- N.B.: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Symbols have their usual meanings.
 4) Use of non-programmable calculator is allowed

- Q.1** Attempt any TWO. 16
1. State the fundamental theorem of calculus and state the theorem of gradient?
 2. State the concept of surface integral? If $\vec{F} = 2xz\hat{i} - y^3\hat{j} + yz\hat{k}$ Evaluate, $\vec{F} \cdot \vec{n} \, d\vec{s}$ Where S is the surface of the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.
 3. By using the divergence theorem Evaluate, $\iint \vec{F} \cdot \hat{n} \, d\vec{s}$ Where, $\vec{F} = 3xz\hat{i} + 2y^2\hat{j} + yz\hat{k}$ and S is the surface of cube bounded by $x = 0$ to 1, $y = 0$ to 1 and $z = 0$ to 1.
 4. Obtain the expression of cylindrical co-ordinate system.
- Q.2** Attempt any TWO. 16
1. Describe collector to base bias method and discuss its advantages and disadvantages.
 2. Show that when the load resistance becomes equal to the output resistance of the amplifier, the gain falls to half of the open circuit voltage gain.
 3. What is stabilization? Explain reasons necessary to ensure the stabilization of operating point.
 4. State and explain any four advantages of introduction of negative feedback in an amplifier circuit.
- Q.3** Attempt any TWO. 16
1. Derive a output voltage for Op-amp as a integrator with neat, labelled diagram? What will be the output when input is Square Wave?
 2. With a neat, labelled circuit diagram explain the use of OP-Amp as Summing amplifier.
 3. Draw the diagram of Hartley oscillator using BJT and explain its operation. Derive expression for resonant frequency.
 4. Draw circuit diagram of Wien Bridge oscillator and derive an expression for the frequency of the oscillator.

Q.4 (A) Attempt any ONE.

04

1. Explain the concept of
1) Line integral 2) Surface integral
2. Evaluate using cylindrical co-ordinates.

$$\int_0^{2\pi} \int_0^3 \int_0^{z/3} r^3 dr dz d\theta$$

(B) Attempt any ONE.

04

1. Find the value of collector emitter voltage for potential divider method if $I_C = 2.25 \text{ mA}$, $V_{CC} = 30\text{V}$, $R_C = R_E = 5\text{K}\Omega$.
2. If an amplifier has a lower and higher cutoff frequency as 100 KHz and 300 KHz respectively and voltage gain of 100, what will be the new bandwidth if 5% of negative feedback is introduced.

(C) Attempt any ONE.

04

1. A Hartley oscillator is designed by using the following passive components. $C = 0.002\mu\text{F}$, $L_1 = 60\mu\text{H}$ and $L_2 = 10\mu\text{H}$. find the gain, minimum gain and oscillating frequency.
2. An Op-amp is used as 3 input inverting adder with $R_1 = R_F = 5\text{K}\Omega$, $V_1 = +1\text{V}$, $V_2 = -2\text{V}$, $V_3 = +4.5\text{V}$ find the output voltage. If the R_1 value is reduced to $10\text{K}\Omega$, keeping R_F the same, what will be new output voltage?
