

QUESTION BANK
SEM III PHYSICS PAPER II

Q) Select the correct option

1. Divergence theorem connects

- a) Line integral to surface integral
- b) a surface integral to volume integral
- c) a line integral to volume integral
- d) none of above

2. A position vector operator in three dimensions is

- (a) $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ (b) $\vec{r} = \sqrt{(x^2 + y^2 + z^2)}$
- (c) $\vec{r} = x + y + z$ (d) $\vec{r} = xyz\hat{r}$

3. The phase difference between the output and input voltages of CE amplifier is _____

- (a) 90° (b) 180° (c) 270° (d) 0°

4. The stability factor value for the base resistor bias is _____

- (a) $1-\beta$ (b) $1+\beta$ (c) $(1+\beta)R_B$ (d) $(1+\beta)R_C$

5. In sustaining oscillations, the loop gain should be _____

- (a) < 1 (b) ≥ 1
- (c) zero (d) infinite

6. A differential amplifier _____

- (a) Rejects common-mode signals
- (b) Amplifies the differential mode signals
- (c) Both (a) and (b)
- (d) None of the above

7. The gradient of $x\hat{i} + y\hat{j} + z\hat{k}$ is _____.

- (a) 0 (b) 1
- (c) 2 (d) 3

8. Cylindrical coordinate system is _____.

- (a) Orthogonal (b) non-orthogonal
(c) parallel (d) none of these

9. If the value of collector current I_C increases, then the value of V_{CE} _____

- (a) remains the same (b) decreases
(c) increases (d) none of these

10. If the amplifier power is doubled then power gain in dB is increased by _____.

- (a) 3 dB (b) -3dB
(c) 6 dB (d) -6dB

11. A Colpitt's oscillator uses _____.

- (a) inductive feedback (b) tapped capacitance
(c) no tuned LC circuit (d) None of these

12. _____ circuit provides an output voltage proportional to or equal to the algebraic sum of input voltage.

- (a) Integrator (b) Differentiator
(c) Inverting adder (d) None of these

13. Volume element in cylindrical system is _____

- (a) $rdrd\theta dz$ (b) $r^2drd\theta d\phi$
(c) $r\sin\theta drd\theta dz$ (d) $r^2dr\sin\theta d\theta dz$

14. The output power of a CE amplifier is more than the input power because the additional power is supplied by _____.

- (a) transistor (b) biasing circuit
(c) dc supply V_{CC} (d) None of these

15. When the temperature changes, the operating point is shifted due to _____.

- (a) change in V_{CC} (b) Change in I_{CBO}

- (c) Changes in values of circuit resistances (d) None of the above

16. Colpitt's oscillator has frequency 28Khz, if $C_1 = 1000\text{pF}$ and $C_2 = 5000\text{pF}$, the tuned value of inductor is

- (a) 0.4mH (b) 4mH

- (c) 40mH (d) 400mH

17. An OPAMP has _____.

- (a) High input impedance and low output impedance
(b) Very high output and very low input impedance
(c) Low input impedance but very high open loop gain

- (d) High input impedance and low open loop gain

18. A necessary and sufficient condition that the line integral $\int A \cdot dr = 0$ for every close curve C is _____

- (a) $\text{div } A = 0$ (b) $\text{div } A \neq 0$ (c) $\text{curl } A \neq 0$ (d) $\text{Curl } A = 0$

19.

The gradient of a scalar function $\phi(x, y, z)$ is

(A) $\frac{\partial^2 \phi}{\partial x^2} \hat{i} + \frac{\partial^2 \phi}{\partial y^2} \hat{j} + \frac{\partial^2 \phi}{\partial z^2} \hat{k}$

(B) $\frac{\partial \phi}{\partial x} + \frac{\partial \phi}{\partial y} + \frac{\partial \phi}{\partial z}$

(C) $\frac{\partial \phi}{\partial x} \hat{i} + \frac{\partial \phi}{\partial y} \hat{j} + \frac{\partial \phi}{\partial z} \hat{k}$

(D) $\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} + \frac{\partial^2 \phi}{\partial z^2}$

20.

If $f(x, y, z) = 3x^2y + 2y - 3z$, then $\nabla f =$

(A) $(6x^2y, 3x^2, 3)$

(B) $(6xy, 3x^2 + 2, 3)$

(C) $(6xy, 3x^2, -3)$

(D) $(6xy, 3x^2 + 2, -3)$

21.

If $\vec{F} = f_1(x, y, z)\hat{i} + f_2(x, y, z)\hat{j} + f_3(x, y, z)\hat{k}$ is a vector function, then the divergence of F is

(A) $\frac{\partial^2 f_1}{\partial x^2} \hat{i} + \frac{\partial^2 f_2}{\partial y^2} \hat{j} + \frac{\partial^2 f_3}{\partial z^2} \hat{k}$

(B) $\frac{\partial f_1}{\partial x} + \frac{\partial f_2}{\partial y} + \frac{\partial f_3}{\partial z}$

(C) $\frac{\partial f_1}{\partial x} \hat{i} + \frac{\partial f_2}{\partial y} \hat{j} + \frac{\partial f_3}{\partial z} \hat{k}$

(D) $\frac{\partial^2 f_1}{\partial x^2} + \frac{\partial^2 f_2}{\partial y^2} + \frac{\partial^2 f_3}{\partial z^2}$

22.

Find the divergence of the vector field $\mathbf{F} = \theta = -\sin \theta \mathbf{i} + \cos \theta \mathbf{j}$

$$\nabla \cdot \mathbf{F} = -\cos \theta - \sin \theta$$

$$\nabla \cdot \mathbf{F} = \frac{2 \sin \theta \cos \theta}{r} = \frac{\sin 2\theta}{r}$$

$$\nabla \cdot \mathbf{F} = 0$$

$$\nabla \cdot \mathbf{F} = -\frac{2 \sin \theta \cos \theta}{r} \mathbf{i} + \frac{2 \sin \theta \cos \theta}{r} \mathbf{j}$$

23. A point P has Cartesian coordinates (3,-4,10). What is the cylindrical r coordinate of this point?

- a. 5
- b. 25
- c. $\sqrt{93}$
- d. $5 \cdot \sqrt{5}$

24. Which of the following is valid set of spherical coordinates of a point?

- a. (3.5, -1, -1)
- b. $(-\pi, \pi/2, \pi)$
- c. (2, 2, 2)
- d. $(-2, \pi/2, -\pi/4)$

25. The volume of a parallelepiped in Cartesian is

$$dV = dx dy dz$$

$$dV = dx dy$$

$$dV = dy dz$$

$$dV = dx dz$$

26.

Given the point $A(1, \frac{\pi}{3}, 3)$ in cylindrical coordinates. Which of the followings is the z component of A in rectangular coordinate?

- (A) 1 (B) $\frac{\pi}{3}$ (C) 3 (D) -3 (E) none of them

27.

Given the point $C(-2, -1, 5)$ in rectangular coordinates. Which of the followings is true for the θ component of C in cylindrical coordinate?

- (A) $0 < \theta < \frac{\pi}{2}$
(B) $\frac{\pi}{2} < \theta < \pi$
(C) $\pi < \theta < \frac{3\pi}{2}$
(D) $\frac{3\pi}{2} < \theta < 2\pi$
(E) none of them

28. A differential amplifier

- 1. is a part of an Op-amp
- 2. has one input and one output
- 3. has two outputs
- 4. answers (1) and (2)

29. In the common mode,

- 1. both inputs are grounded
- 2. the outputs are connected together
- 3. an identical signal appears on both the inputs
- 4. the output signal are in-phase

30. If $A_{DM} = 3500$ and $A_{CM} = 0.35$, the CMRR is

1. 1225
2. 10,000
3. 80 dB
4. answers (1) and (3)

31. The output of a particular Op-amp increases 8V in 12 μ s. The slew rate is

1. 90 V/ μ s
2. 0.67 V/ μ s
3. 1.5 V/ μ s
4. none of these

32. In an LC transistor oscillator, the active device is

1. LC tank circuit
2. Biasing circuit
3. Transistor
4. None of the above

33. In an LC oscillator, the frequency of oscillator is L or C.

1. Proportional to square of
2. Directly proportional to
3. Independent of the values of
4. Inversely proportional to square root of

34. An oscillator employs feedback

1. Positive
2. Negative
3. Neither positive nor negative
4. Data insufficient

35. In Colpitt's oscillator, feedback is obtained

1. By magnetic induction
2. By a tickler coil
3. From the centre of split capacitors
4. None of the above

36. When negative voltage feedback is applied to an amplifier, its voltage gain

1. Is increased
2. Is reduced
3. Remains the same
4. None of the above

37. Emitter follower is used for

1. Current gain
2. Impedance matching
3. Voltage gain
4. None of the above

38. Due to presence of a capacitor in feedback path, the output of an integrator varies _____

- a. Gradually
- b. Instantaneously
- c. Intermittently
- d. All of the above

39. What is the feedback factor of voltage follower circuit?

- a. Zero
- b. Unity
- c. Infinity
- d. Between zero & one

40. Transistor biasing represents Conditions

1. a.c.
2. d.c.
3. both a.c. and d.c.
4. none of the above

41. Operating point represents

1. Values of I_C and V_{CE} when signal is applied
2. The magnitude of signal
3. Zero signal values of I_C and V_{CE}
4. None of the above

42. For proper operation of the transistor, its collector should have

1. Proper forward bias
2. Proper reverse bias
3. Very small size
4. None of the above

43. The operating point is also called the

1. Cut off point
2. Quiescent point
3. Saturation point
4. None of the above

44. If the value of collector current I_C increases, then the value of V_{CE}

1. Remains the same
2. Decreases
3. Increases
4. None of the above

45. The value of stability factor for a base resistor bias is

1. $R_B (\beta+1)$
2. $(\beta+1)R_C$
3. $(\beta+1)$
4. $1-\beta$

46. In a pnp transistor, the current carriers are

1. acceptor ions
2. donor ions
3. free electrons
4. holes

47. In a transistor

$$I_C = I_E + I_B$$

$$I_B = I_C + I_E$$

$$I_E = I_C - I_B$$

$$I_E = I_C + I_B$$

48. Curl of a gradient of a vector is

1. Unity
2. Zero
3. Null Vector
4. Depends on the constants of the vector

49. Find the gradient of $t = x^2y + e^z$ at the point $p(1,5,-2)$

$$i + 10j + 0.135k$$

$$10i + j + 0.135k$$

$$i + 0.135j + 10k$$

$$10i + 0.135j + k$$

50. BJT stands for _____

- a) Bi-Junction Transfer
- b) Blue Junction Transistor
- c) Bipolar Junction Transistor
- d) Base Junction Transistor