M.Sc Geophysics Code No (491)

Set No. 1 **Question Booklet No.**

16P/204/4

(To be filled up by the candidate by blue/black ball-point pen)

Roll No. | | | | | | | | | | |

Serial No. of OMR Answer Sheet ..... (2016) .....

Day and Date .... **(Signature of Invigilator)**

INSTRUCTIONS TO CANDIDATES

(Use only ***blue/black ball-point pen*** in the space above and on both sides of the **Answer Sheet**)

1. Within 30 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.
2. Do not bring any loose paper, written or blank, inside the Examination Hall ***except the Admit Card without its envelope***.
3. ***A separate Answer Sheet is given. It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.***
4. Write your Roll Number and Serial Number of the Answer Sheet by pen in the space provided above.
5. ***On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.***
6. ***No overwriting is allowed in the entries of Roll No., Question Booklet no. and Set no. (if any) on OMR sheet and Roll No. and OMR sheet no. on the Question Booklet.***
7. ***Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfairmeans.***
8. ***Each question in this Booklet is followed by four alternative answers. For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet.***
9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.
10. *Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).*
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. Deposit only **OMR *Answer Sheet*** at the end of the Test.
13. *You are not* permitted to leave the Examination Hall until the end of the Test.
14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

Total No. of Printed Pages : 40

[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण पृष्ठ पर दिये गए हैं।]

ROUGH WORK

रफ़ कार्य

16P/204/4

No. of Questions : 150

प्रश्नों की संख्या : 150

Time : $2\frac{1}{2}$ Hours ***Full Marks : 450***

समय : $2\frac{1}{2}$ घण्टे ***पूर्णांक : 450***

Note : (1) Attempt as many questions as you can. Each question carries **3 (Three)** marks. ***One mark will be deducted for each incorrect answer.*** **Zero** mark will be awarded for each unattempted question.

अधिकाधिक प्रश्नों को हल करने का प्रयत्न करें। प्रत्येक प्रश्न **3** (तीन) अंकों का है। *प्रत्येक गलत उत्तर के लिए एक अंक काटा जायेगा।* प्रत्येक अनुत्तरित प्रश्न का प्राप्तांक *शून्य* होगा।

(2) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

यदि एकाधिक वैकल्पिक उत्तर सही उत्तर के निकट प्रतीत हों, तो निकटतम सही उत्तर दें।

01. If $(\bar{x},\bar{y})$ are the coordinates of the centre of gravity of the arc of the astroid $x^{2/3} + y^{2/3} = a^{2/3}$ lying in the first quadrant, then :

(1) $\bar{x} = \bar{y} = \frac{2a}{5}$ (2) $\bar{x} = \bar{y} = \frac{a}{5}$

(3) $\bar{x} = \bar{y} = \frac{3a}{5}$ (4) $\bar{x} = \bar{y} = \frac{a}{3}$

02. A uniform ladder rests in limiting equilibrium with its lower end on a rough horizontal plane and its upper end against a smooth wall. If μ is the coefficient of friction and θ is the inclination of the ladder to the vertical, then :

(1) $\tan\theta = \mu$ (2) $\tan\theta = 2\mu$

(3) $2\tan\theta = \mu$ (4) $\tan\mu = \theta$

03. In the case of a catenary, the relation between c, s and x is given by :

(1) $s = c\sec\frac{x}{c}$ (2) $s = c\cos h\frac{x}{c}$

(3) $s = c\sin\frac{x}{c}$ (4) $s = c\sin h\frac{x}{c}$

04. A uniform chain of length l is suspended from two points A and B in the same horizontal line in the form of a catenary. If the tension at A is twice the tension at the lowest point, then span AB is :

(1) $\frac{l}{\sqrt{3}}\log\left(1+\sqrt{3}\right)$ (2) $\frac{l}{\sqrt{3}}\log\left(2-\sqrt{3}\right)$

(3) $\frac{l}{\sqrt{3}}\log\left(2+\sqrt{3}\right)$ (4) $\frac{l}{\sqrt{2}}\log\left(2+\sqrt{3}\right)$

05. A uniform rod of lenght 2a rests in equilibrium against a smooth peg distant b from the wall. In the position of equilibrium, the rod is inclined to the vertical wall at an angle :

(1) $\sin^{-1}\left(\frac{b}{a}\right)$ (2) $\sin^{-1}\left(\frac{b}{a}\right)^{1/2}$

(3) $\sin^{-1}\left(\frac{b}{a}\right)^{1/3}$ (4) $\cos^{-1}\left(\frac{b}{a}\right)^{1/3}$

06. Six equal rods AB, BC, CD, DE, EF and FA are each of weight W and are freely jointed at their extremities so as to form a hexagon. The rod AB is fixed in a horizontal position and the middle points of AB and DE are jointed by a string. The tension of the string is :

(1) 6 W (2) 3 W (3) 2 W (4) W

07. Forces P, Q, R act along the sides BC, CA, AB of a triangle ABC. If their resultant passes through the centre of the circumscribing circle of the triangle, then :

(1) $P + Q + R = 0$

(2) $P \sin A + Q \sin B + R \sin C = 0$

(3) $P + Q - R = 0$

(4) $P \cos A + Q \cos B + R \cos C = 0$

08. If a system of coplanar forces (1, 0), (0, 2), (–3, 0) and (0, – 4) act at the points (0, 0), (1, 0), (1, 1) and (0, 1), then the equation of the line of action of their resultant is :

(1) $x - y = 5/2$ (2) $y - x = 5/2$

(3) $y - x = 5$ (4) $y + x = 5/2$

09. If a particle describes the curve $r = a\ e^{\theta}$ with constant angular velocity w, the radial component of the acceleration of the particle is :

(1) 0 (2) $r w^2$ (3) $2r w^2$ (4) $- r w^2$

10. In a simple harmonic motion of amplitude a and period T, the velocity v at a distance x from the centre is given by the relation :

(1) $v^2 T^2 = (a^2 - x^2)$ (2) $v^2 T^2 = 4\pi^2 (a^2 - x^2)$

(3) $v T = 2\pi (a^2 - x^2)$ (4) $v^2 T^2 = 4\pi^2 (a^2 + x^2)$

11. A heavy particle hangs from 0 by a string of lenght a. It is projected horizontally with a velocity u such that $u^2 = \frac{7ag}{2}$. The string becomes slack when it has described an angle :

(1) $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$ (2) $\cos^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

(3) $\cos^{-1}\left(-\frac{1}{2}\right)$ (4) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

12. The moment of inertia of a uniform cube of side 2a and mass M about any axis through its centre is :

(1) $\frac{1}{3}$ Ma^2 (2) $\frac{2}{3}$ Ma^2 (3) $\frac{5}{3}$ Ma^2 (4) $\frac{11}{3}$ Ma^2

13. A solid sphere of radius a oscillates about a tangent at the heightest point as a horizontal axis. The length of the simple equivalent pendulum is :

(1) $\frac{2}{5}$ a (2) $\frac{2}{3}$ a (3) $\frac{5}{3}$ a (4) $\frac{7}{5}$ a

14. A circular plate rotates about an axis through its centre perpendicular to its plane with angular velocity w. If the axis is set free and a point in the circumference of the plate is fixed, then the resulting angular velocity is :

(1) $\frac{w}{3}$ (2) $\frac{w}{2}$ (3) $\frac{2w}{3}$ (4) $\frac{3w}{4}$

15. A square lamina of side a is vertically immersed in a liquid with one side in the free surface of the liquid. The depth of centre of pressure from the free surface is :

(1) $\frac{a}{3}$ (2) $-\frac{a}{3}$ (3) $\frac{2a}{3}$ (4) $\frac{3a}{4}$

16. The n^{th} differential coefficient of $\log \{ (ax + b) (cx + d) \}$ is :

(1) $(-1)^{n-1} (n - 1) ! [a^n (ax + b)^{-n} + c^n (cx + d)^{-n}]$

(2) $(-1)^n n! [a^n (ax + b)^{-n} + c^n (cx + d)^{-n}]$

(3) $(-1)^n n! [a^n (ax + b)^{-(n+1)} + c^n (cx + d)^{-(n+1)}]$

(4) $(-1)^{n-1} (n - 1) ! [a^n (ax + b)^n + c^n (cx + d)^n]$

17. If $y = e^{a\sin^{-1}x}$ and $y_1 = \frac{dy}{dx}$, $y_2 = \frac{d^2y}{dx^2}$, then

(1) $(1 - x^2) y_2 - xy_1 = ay$ (2) $(1 - x^2) y_2 + xy_1 = a^2y$

(3) $(1 + x^2) y_2 - xy_1 = a^2y$ (4) $(1 - x^2) y_2 - xy_1 = a^2y$

18. $\lim_{n\to\infty} \sum_{r=1}^{n-1} \frac{1}{\sqrt{n^2 - r^2}}$ is equal to :

(1) 0 (2) $\frac{\pi}{2}$ (3) π (4) $\frac{\pi}{4}$

19. The number of asymptotes of the curve $y^2 (x^2 - a^2) = x^2 (x^2 - 4a^2)$ parallel to x - axis :

(1) 2 (2) 4

(3) 1 (4) none of these

20. If the equation of curve $r = f(\theta)$ remains unaltered on replacing θ by $\pi - \theta$, then the curve is symmetrical about the line :

(1) $\theta = \frac{\pi}{4}$ (2) $\theta = \pi$

(3) $\theta = \frac{\pi}{2}$ (4) none of these

21. The number of loops in the curve $r = \sin 5\theta$ is :

(1) 10 (2) 5

(3) 4 (4) none of these

22. The radius of curvature at (x, y) for the curve $a^2y = x^3 - a^3$ is :

(1) $\frac{(a^4+9x^4)^{\frac{3}{2}}}{6a^4x}$ (2) $\frac{(a^4+3x^4)^{\frac{3}{2}}}{3a^4x}$

(3) $\frac{(a^4+9x^4)^{\frac{3}{2}}}{3a^4x}$ (4) $\frac{(a^4+9x^4)^{\frac{3}{2}}}{6a^4x^2}$

23. The radius of curvature for the pedal equation $r = f(p)$ is :

(1) $\rho = r\frac{dp}{dr}$ (2) $\rho = r\frac{dr}{dp}$ (3) $\rho = \frac{dp}{dr}$ (4) $\rho = \frac{1}{r}\frac{dr}{dp}$

24. $\int_0^{\frac{\pi}{2}} \log \tan x \, dx$ is equal to :

(1) $-\frac{\pi}{2}\log 2$ (2) $\frac{\pi}{2}\log 2$

(3) $\frac{\pi}{4}\log 2$ (4) none of these

25. If u, v are functions of r, θ and r, θ are functions of x, y, then $\frac{\partial(u,v)}{\partial(x,y)} =$

(1) $\frac{\partial(u,v)}{\partial(r,\theta)} \times \frac{\partial(r,\theta)}{\partial(x,y)}$ (2) $\frac{\partial(u,v)}{\partial(r,\theta)} \times \frac{\partial(x,y)}{\partial(r,\theta)}$

(3) $\frac{\partial(u,v)}{\partial(x,y)} \times \frac{\partial(x,y)}{\partial(r,\theta)}$ (4) None of these

26. If $x = r\cos\theta$ and $y = r\sin\theta$, then $\frac{\partial(x,y)}{\partial(r,\theta)} =$

(1) $\frac{1}{r}$ (2) 1

(3) r (4) none of these

27. The value of $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\, dx\, dy$ is :

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{4}$

(3) $\frac{\pi}{3}$ (4) none of these

28. The value of $\int_0^1 \int_0^1 (x^2 + y^2)\, dx\, dy =$

(1) 1 (2) 0 (3) $\frac{1}{3}$ (4) $\frac{2}{3}$

29. Length of complete cycloid $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$ is equal to :

(1) 2 a (2) 4 a (3) 8 a (4) 16 a

30. The value of $\int_0^a \frac{x^4}{\sqrt{a^2 - x^2}}\, dx =$

(1) $\frac{3a^4}{16}$ (2) $\frac{3\pi a^2}{16}$

(3) $\frac{3\pi a^4}{16}$ (4) none of these

31. The value of $\frac{(\cos\theta + i\sin\theta)^{100}}{(\cos\theta - i\sin\theta)^{-100}}$, $0 < \theta < \frac{\pi}{2}$, $i = \sqrt{-1}$, is

(1) 1 (2) $(\cos\theta + i\sin\theta)^{200}$

(3) $(\cos\theta - i\sin\theta)^{200}$ (4) $(\cos\theta - i\sin\theta)^{-100}$

32. If $2\cos\theta = x + \frac{1}{x}$, $0 < \theta < \frac{\pi}{2}$, and $2\cos\phi = y + \frac{1}{y}$, $0 < \phi < \frac{\pi}{2}$, then the value of $x^{100}\, y^{50} + \frac{1}{x^{100}\, y^{50}}$ is :

(1) $2\cos(100\,\theta - 50\phi)$ (2) $2\cos(100\,\theta + 50\phi)$

(3) $2\sin(100\,\theta + 50\phi)$ (4) $2\sin(100\,\theta - 50\phi)$

33. If $\cos\alpha + \cos\beta + \cos\gamma = 0$ and $\sin\alpha + \sin\beta + \sin\gamma = 0$, $0 \le \alpha, \beta, \gamma \le \pi$, then the value of $\cos 3\alpha + \cos 3\beta + \cos 3\gamma$ is :

(1) $3\sin(\alpha + \beta + \gamma)$ (2) $\cos(\alpha + \beta + \gamma)$

(3) $2\cos(\alpha + \beta + \gamma)$ (4) $3\cos(\alpha + \beta + \gamma)$

34. If $\cos\alpha + \cos\beta + \cos\gamma = 0$ and $\sin\alpha + \sin\beta + \sin\gamma = 0$, $0 \le \alpha,\beta,\gamma \le \pi$, then the value of $\sin 3\alpha + \sin 3\beta + \sin 3\gamma$ is :

(1) $3\sin(\alpha + \beta + \gamma)$ (2) $2\sin(\alpha + \beta + \gamma)$

(3) $\sin(\alpha + \beta + \gamma)$ (4) $4\sin(\alpha + \beta + \gamma)$

35. If $(a_1 + ib_1)(a_2 + ib_2)(a_3 + ib_3) = A + iB$ then the value of

$$\tan^{-1}\left(\frac{b_1}{a_1}\right) + \tan^{-1}\left(\frac{b_2}{a_2}\right) + \tan^{-1}\left(\frac{b_3}{a_3}\right) \text{ is :}$$

(1) $\tan^{-1}(B)$ (2) $\tan^{-1}\left(\frac{B}{A}\right)$

(3) $\tan^{-1}(A)$ (4) $\tan^{-1}(A + B)$

36. If $(c_1 + id_1)(c_2 + id_2)(c_3 + id_3) = C + i\,D$ then the value of $(c_1^2 + d_1^2)(c_2^2 + d_2^2)(c_3^2 + d_3^2)$ is :

(1) D^2 (2) C^2 (3) $C^2 - D^2$ (4) $C^2 + D^2$

37. Let n be a positive integer. By the use of De-Moiver's theorem, the roots of the equation $(x-1)^n = x^n$ are

(1) $\frac{1}{2}\left(1 + i\cot\frac{r\pi}{n}\right), 0 \le r \le n-1$ (2) $\frac{1}{2}\left(1 - i\cot\frac{r\pi}{n}\right), 0 \le r \le n-1$

(3) $\frac{1}{2}\left(1 + i\tan\frac{r\pi}{n}\right), 0 \le r \le n-1$ (4) $\frac{1}{2}\left(1 - i\tan\frac{r\pi}{n}\right), 0 \le r \le n-1$

38. The value of $\left(\sqrt{3}+i\right)^{600} + \left(\sqrt{3}-i\right)^{600}$ is :

(1) 2^{603} (2) 2^{601} (3) 2^{602} (4) 2^{600}

39. The value of $(1 + i)^4 + (1 - i)^4$ is :

(1) 4 (2) –4 (3) 8 (4) –8

40. Let $\mathbb{N}$ be the set of all natural numbers. The general value of $\log_e(-5)$ is given by :

(1) $\log_e 5-(2n+1)\pi i, n\in\mathbb{N}$ (2) $\log_e 5-2n\pi i, n\in\mathbb{N}$

(3) $\log_e 5+2n\pi i, n\in\mathbb{N}$ (4) $\log_e 5+(2n+1)\pi i, n\in\mathbb{N}$

41. Let IR be the set of all real numbers. The value of $\tan\left(i\log\left(\frac{a-ib}{a+ib}\right)\right)$, $a, b \in IR, a \neq b$, is :

(1) $\frac{2ab}{a^2-b^2}$ (2) $\frac{2ab}{a^2+b^2}$

(3) $\frac{ab}{a^2-b^2}$ (4) $\frac{ab}{a^2+b^2}$

42. If $x \in IR$ then the value of $i\log\left(\frac{x-i}{x+i}\right)$ is :

(1) $\pi - \tan^{-1} x$ (2) $\pi + 2\tan^{-1} x$

(3) $\pi - 2\tan^{-1} x$ (4) $\pi + \tan^{-1} x$

43. If α, β, γ are the roots of the equation $x^3 + 2x^2 + 7x + 2 = 0$

Then the value of $\tan^{-1}\alpha + \tan^{-1}\beta + \tan^{-1}\gamma$ is :

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{2}$ (4) π

44. The expansion of $2^6 \cos^7\theta$, $\theta \in$ IR, is :

(1) $\cos 7\theta + 7\cos 5\theta + 21\cos 3\theta + 35\cos\theta$

(2) $\cos 7\theta + 7\cos 5\theta + 21\cos 3\theta - 35\cos\theta$

(3) $\cos 7\theta + 7\cos 5\theta - 21\cos 3\theta + 35\cos\theta$

(4) $\cos 7\theta - 7\cos 5\theta + 21\cos 3\theta + 35\cos\theta$

45. The expansion of $2^7 \sin^8\theta$, $\theta \in$ IR, is :

(1) $\cos 8\theta - 8\cos 6\theta + 28\cos 4\theta + 56\cos 2\theta + 35$

(2) $\cos 8\theta - 8\cos 6\theta + 28\cos 4\theta - 56\cos 2\theta + 35$

(3) $\cos 8\theta + 8\cos 6\theta + 28\cos 4\theta - 56\cos 2\theta + 35$

(4) $\cos 8\theta - 8\cos 6\theta - 28\cos 4\theta - 56\cos 2\theta + 35$

46. $\frac{mx+n}{(x-a)(x+b)}$ is equal to :

(1) $\frac{1}{a+b}\left(\frac{ma+n}{x-a}+\frac{mb-n}{x+b}\right)$ (2) $\frac{1}{a-b}\cdot\frac{(ma+n)}{(x-a)}+\frac{1}{a+b}\frac{(mb-n)}{(x+b)}$

(3) $\frac{1}{a^2-b^2}\cdot\left(\frac{m+na}{x-a}+\frac{m-nb}{x+b}\right)$ (4) none of the above.

47. The general term of $\frac{3x^2+x-2}{(x-2)^2(1-2x)}$, when expanded in a series of ascending powers of x is :

(1) $\left(-\frac{1}{3}+\frac{5}{6}\cdot\frac{1}{2^r}-\frac{r-1}{2^r}\right)x^r$ (2) $\left(-\frac{2^r}{3}+\frac{5}{6}\cdot\frac{1}{2^r}-\frac{r-1}{2^r}\right)x^r$

(3) $\left(-\frac{2^r}{3}+\frac{5}{6}\cdot\frac{1}{2^r}+\frac{r+1}{2^r}\right)x^r$ (4) none of the above.

48. If p, q and r are any real numbers then

(1) max (p,q) < max (p, q, r) (2) $\min(p,q)=\frac{1}{2}(p+q-|p-q|)$

(3) min (p,q) < min (p,q,r) (4) none of above

49. If p,q, r be three positive numbers, then the value of (p +q) (q + r) (r +p) is :

(1) < 4 pqr (2) < 8 pqr

(3) $\geq$8 pqr (4) > 4 pqr but < 8 pqr

50. If a, b, c are real numbers such that $a^2 + b^2 + c^2 = 1$, then ab+bc +ca >.....

(1) $\frac{1}{2}$ (2) $-\frac{1}{2}$ (3) 2 (4) -2

51. If $\frac{x^2-bx}{ax-c}=\frac{k-1}{k+1}$ has roots where magnitudes are equal but signs are opposite the value of k must be :

(1) $\frac{a-b}{a+b}$ (2) $\frac{a+b}{a-b}$ (3) C (4) 1/C

52. The number of solutions to the equation $x^2 - 5|x| + 6$ is :

(1) 2 (2) 4

(3) 6 (4) none of these

53. If α,β are the roots of $ax^2 + bx + c = 0$, $\alpha+h$, $\beta+h$ are roots of $px^2 + qx + \gamma = 0$ and D_1, D_2 are respective discriminants of these equations then $D_1 : D_2$ is equal to :

(1) a^2/p^2 (2) b^2/q^2

(3) c^2/r^2 (4) none of these

54. If the roots of the quadratic equation $x^2 - 4x - \log_3 a = 0$ are real, then the least value of a is equal to :

(1) 81 (2) 1/81

(3) 1/64 (4) none of these

55. The condition that $x^3 - px^2 + qx - r = 0$ may have two of its roots equal to each other but of opposite sign is :

(1) $r = pq$ (2) $r = 2p^3 + pq$

(3) $r = p^2q$ (4) none of these

56. The difference between the larger root and smaller root of $x^2 - px + \frac{p^2-1}{4} = 0$ is :

(1) 0 (2) 1 (3) 2 (4) $-p + 1$

57. Which is not possible ? The no. of real roots of the equation $ax^4 + bx^3 + cx^2 + dx + e = 0$, where a, b, c, d and e are real coefficients, may be :

(1) 4 (2) 3 (3) 2 (4) 0

58. If $\alpha_1, \alpha_2, \ldots\ldots \alpha_n$ are roots of the equation $x^n + nax - b = 0$, then $(\alpha_1 - \alpha_2)(\alpha_1 - \alpha_3)\ldots\ldots (\alpha_1 - \alpha_n)$ is equal to :

(1) $n(\alpha_1^{n-1} + a)$ (2) $\alpha_1^n + a$

(3) $n\alpha_1^{n-1} + a$ (4) $\alpha_1^{n-1} + na$

59. If we square either of the imaginary cube roots of unity, we obtain :

(1) a 6^{th} root of unity (2) Its real root

(3) The other imaginay root (4) none of these

60. If the roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A.P. then the difference between its two roots is :

(1) 1 (2) 3 (3) $\sqrt{2}$ (4) $\sqrt{i}$

61. The least possible number of positive roots of the equation $2x^7 - x^4 + 4x^3 - 5 = 0$ is

(1) 2 (2) 4

(3) 6 (4) none of the above

62. If f (a) and f (b) are of opposite signs, then the number of roots of f (x) = 0 lying between a and b is :

(1) odd
(2) Even
(3) Either even or odd
(4) None of the above

63. The system of equations

$\alpha x + y + z = \alpha - 1$

$x + \alpha y + z = \alpha - 1$

$x + y + \alpha z = \alpha - 1$

has no solution if α is

(1) 1
(2) not (–2)
(3) either –2 or 1
(4) – 2

64. If a square matrix A is such that $AA^T = I = A^TA$, then $|A|$ is equal to :

(1) 0
(2) $\pm$ 1
(3) $\pm$ 2
(4) none of these

65. If $x = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, the value of x^n is equal to :

(1) $\begin{bmatrix} 3n & -4n \\ n & n \end{bmatrix}$
(2) $\begin{bmatrix} 2+n & 5-n \\ n & n \end{bmatrix}$
(3) $\begin{bmatrix} 3^n & (-4)^n \\ 7^n & (-7)^n \end{bmatrix}$
(4) none of these

66. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}$, $6A^{-1} = A^2 + CA + dI$, then (C, d) is :

(1) (-6, 11) (2) (-11, 6) (3) (11, 6) (4) (6, 11)

67. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix} = x + iy$, then :

(1) $x = 3, y = 1$ (2) $x = 1, y = 3$

(3) $x = 0, y = 3$ (4) $x = 0 y = 0$

68. If $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$, $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then which of the following holds for $n \geq 1$, by the principle of mathematical induction :

(1) $A^n = 2^{n-1} A + (n - 1) I$ (2) $A^n = n A + (n - 1) I$

(3) $A^n = 2^{n-1} A - (n - 1) I$ (4) $A^n = n A - (n - 1) I$

69. Let a, b, c be positive real numbers. Then the following system of equation in x, y and z :

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$$

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

$$-\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1 \text{ has}$$

(1) no solution (2) unique solution

(3) infinitely many solution (4) none of these

70. If the value of the determinant $\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix} > 0$, then

(1) $abc > 1$ (2) $abc > -8$

(3) $abc < -8$ (4) $abc > -2$

71. The maximum number of different possible non-zero entries in a skew-symmetric matrix of order n is :

(1) $\frac{1}{2}(n^2 - n)$ (2) $\frac{1}{2}(n^2 + n)$

(3) n^2 (4) none of the above

72. Mark the incorrect statement : If A* and B* are transpore of conjugates of A and B respectively, then :

(1) $(A^*)^* = A$

(2) $(AB)^* = A^* B^*$, A and B being conformable to multiplication.

(3) $(A + B)^* = A^* + B^*$, A and B are being comparable.

(4) $kA^* = kA^*$, k being any complex number and $\bar{k}$ denotes the conjugate of K.

73. The system of equations

$x + 2y + 3z = 0$

$3x + 4y + 4z = 0$

$7x + 10y + 12z = 0$

(1) possesses a trivial solution only

(2) possesses a unique non-trivial solution

(3) has infinitely many solution

(4) none of these.

74. The two eign values of matrix $\begin{bmatrix} 1 & 0 & 0 & -a/2 \\ 0 & 1 & 0 & -a/2 \\ 0 & 0 & 1 & -a/2 \\ 0 & 0 & 0 & a \end{bmatrix}$ are

(1) 1 and a (2) 1 and – a

(3) $\frac{1}{2}$ and $-\frac{a}{2}$ (4) $-\frac{1}{2}$ and $-\frac{a}{2}$

75. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, then $A^2 - 5A + 7I$ is :

(1) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$ (2) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

(3) $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ (4) none of the above

76. The half life of certain particle in its own frame of reference, which is at rest, is 36 μ sec. Its half life for an observer moving with constant velocity 0.8c with respect to the particle will be :

(1) 21.6 μ sec (2) 40 μ sec (3) 60 μ sec (4) 50.4 μ sec

77. A space ship launched from the earth at the speed of 0.5c fires from its nose a rocket which travels at a speed of 0.5c relative to the space ship. The speed of the rocket with reference to the earth will be :

(1) 1.0 C (2) 0.8 C (3) 0.6 C (4) 0.4 C

78. A certain particle in motion has a kinetic energy equal to its rest energy. The velocity of this particle is :

(1) 0.866 C (2) 0.433 C (3) 0.334 C (4) 0.668 C

79. If the escape velocity on the surface of the earth is v_0 then the escape velocity on another planet whose mass is twice that of earth and radius is half of the radius of the earth, will be :

(1) $4\,v_0$ (2) $2\,v_0$ (3) v_0 (4) $v_0/2$

80. Imagine a light planet revolving round a very massive star in a circular orbit of radius R with a period of revolution T. If T^2 is proportional to $R^{7/2}$ then the gravitational force of attraction between the planet and star is. proportional to :

(1) $R^{-11/2}$ (2) $R^{-9/2}$ (3) $R^{-7/2}$ (4) $R^{-5/2}$

81. If the proper mean life time of π^+ meson is $\tau = 2.5\ \mu$sec then the distance travelled by a burst of π^+ mesons travelling with speed 0.8C will be :

(1) 1000 meter (2) 800 meter

(3) 600 meter (4) 400 meter

82. A 50gm bullet moving with velocity 10m/sec strikes a block of 950 gm at rest and gets embedded in it. The loss in kinetic energy will be :

(1) 5% (2) 20% (3) 95% (4) 80%

83. If $\vec{F}$ is conservative force than :

(1) $\vec{\nabla}.\vec{F} = 0$ (2) $\vec{\nabla}\times\vec{F} = 0$

(3) $\vec{\nabla}\times\vec{\nabla}\times\vec{F} = 0$ (4) $\vec{\nabla}\left(\vec{\nabla}.\vec{F}\right) = 0$

84. A body is rotating with a constant angular velocety $\vec{\omega}$ about an axis passing through the origin of the coordinate system. If $\vec{r}$ is the position vector of a point fixed in the rotating body then the linear velouty $\vec{v}$ of that point is given by

(1) $\vec{v} = \vec{\omega} \times \vec{r}$ (2) $\vec{\omega} = \vec{v} \times \vec{r}$

(3) $\vec{v} = \vec{r} \times \vec{\omega}$ (4) $\vec{\omega} = \vec{r} \times \vec{v}$

85. A cylinder of mass M and radius R is rolling down an inclined plane without slipping. If the height of the inclined plane from the surface of the earth is h then find the speed of the center of mass of the cylinder when it reaches the bottom of inclined plane :

(1) $2\sqrt{gh}$ (2) $\sqrt{2gh}$ (3) $\sqrt{gh}$ (4) $\sqrt{\frac{gh}{2}}$

86. The Bandwidth of a series LCR resonant circuit is given by :

(1) $\frac{R}{2\pi L}$ (2) $\frac{R}{4\pi L}$ (3) $\frac{1}{2\pi RC}$ (4) $\frac{1}{4\pi RC}$

87. *If a battery of emf.* 10 volt is connected in series with an inductance of 10 milihenry and a capacitor of 0.05 microfarad and a resistance of 100 ohms. The charging current in the circuit is :

(1) non-oscillatory (2) critical damped

(3) damped oscillatory (4) undamped oscillatory

88. A tuning fork of frequency 512Hz is vibrated with a sonometer wire and 6 beats per second are heard. The beat frequency reduces when the tension in the string of sonometer is slightly increased. The original frequency of vibration of sonometer is :

(1) 506 (2) 500 (3) 542 (4) 518

89. If the input to the full wave rectifier is v (t) = $V_p \sin \omega t$ then the fourier series for the output f (t) of the full wave rectifier is given by :

(1) $f(t) = \frac{2Vp}{\pi} = \frac{4Vp}{\pi} \sum_{n=2,4,6}^{\infty} \frac{\sin n wt}{(n^2-1)}$

(2) $f(t) = \frac{2Vp}{\pi} - \frac{4Vp}{\pi} \sum_{n=2,4,6}^{\infty} \frac{\cos n wt}{(n^2-1)}$

(3) $f(t) = \frac{2Vp}{\pi} - \frac{4Vp}{\pi} \sum_{n=1,3,5}^{\infty} \frac{\sin n wt}{(n^2+1)}$

(4) $f(t) = \frac{2Vp}{\pi} - \frac{4Vp}{\pi} \sum_{n=1,3,5}^{\infty} \frac{\cos n wt}{(n^2+1)}$

90. In a playground there is a small merry go round of radius 4m and mass 12 kg. The radius of gyration of merry go round is 3m.A child of mass 3kg runs at a speed of 10m/sec tangent to the rim of the merry go round, which is at rest, and then jumps on it. Find the angular velouty of the merry go round and the child together neglecting the friction :

(1) 0.58 rad/sec
(2) 0.69 rad/sec
(3) 0.77 rad/sec
(4) 0.83 rad/sec

91. Indicate the false statement about the coriolis force :

(1) It is a fictitious force acting on a moving particle in a aniformly rotating frame of reference.

(2) It is in the direction perpendicular to the direction of motion of the particle

(3) It is along the direction of rotation of the frame of reference

(4) Its magnitude is equal to twice the product of magnitude of velocity of the particle and magnet rotational velocity of frame of reference

92. Two idential straight wires are stretched so as to produce 6 beats per sec when vibrating simultaneously. On changing the tension slightly in one of them the beat frequency remain unchanged. Denoting by T_1 T_2 the higher and the lower tensions in the strings it could be said that while making above changes in the tensions.

(1) T_2 was decreased

(2) T_1 was decreased

(3) T_1 was increased

(4) Beat frequency will change unless both T_1 and T_2 are changed

93. On placing a thin sheet of mica of thickness 12×10^{-5} cm in the path of one of the two interferring beams in Fresnel's biprism experiment it is found that the central fringe was shifted by a distance equal to the width of the bright fringe. If $\lambda = 6 \times 10^{-5}$ cm then find the refractive index of the mica :

(1) 1.35 (2) 1.40 (3) 1.45 (4) 1.50

94. In Newton's ring experiment if we use a source of light emitting two wavelengths $\lambda_1 = 6000A^0$ and $\lambda_2 = 4500A^0$ then it is found that the n^{th} dark ring due to λ_1 coincides with $(n + 1)^{th}$ dark ring due to λ_2. Find the value of n :

(1) 4 (2) 3 (3) 2 (4) 1

95. We wish to use a plate of glass ($\mu = 1.5$) as a polarizer. What must be the angle of incidence so that the reflected light is completely polarized.

(1) 56.3 (2) 65.4^0 (3) 36.5^0 (4) 45.6^0

96. The sodium source of light has a doublet whose components are 5890 A^0 and 5896A^0. Find the minimum number of lines in a grating to resolve this doublet in the first order grating spectrum :

(1) 490 (2) 796 (3) 982 (4) 856

97. A beam of light is analysed by a Nical prism after passing through a quarter wave plate Two positions of maximum intensity and two positions of zero intensity are found on one complete rotation of Nical prism. The light is :

(1) unpolarized (2) plane polarized

(3) Elliptically polarized (4) circularly polarized

98. Indicate the false statement about the dispersive power of a diffraction grating :

(1) It increases with the order of the spectrum

(2) It increases with the grating element

(3) It increases with the number of lines per unit length on the grating

(4) decreases with grating element.

99. If the width of the transparent portion is equal to half the width of opaque portion in a diffraction grating then the missing orders of spectrum will be :

(1) 1^{st}, 3^{rd}, 5^{th} etc (2) 2^{nd}, 4^{th}, 6^{th} etc

(3) 3^{rd}, 6^{th}, 9^{th} etc (4) 5^{th}, 10^{th}, 15^{th} etc

100. In Michelson interferrometer light fringes are formed. It is found that on introducing a glass plate ($\mu = 1.5$) of thickness 0.5 mm the central fring shifts. By what distance the mirror M_1 must be moved to bring the central dark fringe to its initial position on the cross wires :

(1) 0.125 mm (2) 0.25 mm (3) 0.50 mm (4) 0.08 mm

101. If two signals $V_1 = a \sin \omega t$ and $V_2 = b \cos 2\ \omega t$ are applied acrass the horizantal and vertical plates of a C.R.O then the lissaguous figure obtained on the CRO screen will be :

(1) circle (2) ellepse

(3) parabala (4) hyperbala

102. The value of $\vec{\nabla} \times \vec{\nabla} \times \vec{A}$ is given by :

(1) $\vec{\nabla} \cdot \vec{A} - \nabla^2 \vec{A}$ (2) $\vec{\nabla}(\vec{\nabla} \cdot \vec{A}) - \nabla^2 \vec{A}$

(3) $\vec{\nabla} \cdot \vec{A} + \nabla^2 \vec{A}$ (4) $\vec{\nabla}(\vec{\nabla} \cdot \vec{A}) + \nabla^2 \vec{A}$

103. The average value of the Poynting vector for a plane polarized electromagnetic wave in free space is given by :

(1) $\frac{1}{2} \epsilon_0 E_0^2$ (2) $\frac{1}{2} C \epsilon_0 E_0^2$

(3) $\frac{1}{2} \mu_0 B_0^2$ (4) $\frac{1}{2} \mu_0 B_0^2 / C$

104. The Maxwell's equation derived from Gauss's law of electrostatics is :

(1) $\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\epsilon_0}$ (2) $\vec{\nabla} \times \vec{E} = \frac{-\partial \vec{B}}{\partial t}$

(3) $\vec{\nabla} \cdot \vec{B} = 0$ (4) $\vec{\nabla} \times \vec{B} = \mu_0 \left(\vec{J} + \epsilon_0 \frac{\partial \vec{E}}{\partial t} \right)$

105. Indicate the false statement about the high frequency ($w > w_p$) electromagnetic wave propagation through low pressure ionized gases.

(1) phase velocity is greater than the velocity of light in free space

(2) $\vec{E}$ and $\vec{H}$ vectors are in same phase

(3) $\frac{\vec{E}}{\vec{H}}$ in ionized gases is larger than that in free space

(4) waves are attenuated in passing through the ionized gas.

106. If V is the scalar potential and $\vec{A}$ is the vector potential then indicate the relation which is not true :

(1) $\vec{E} = - \vec{\nabla} V - \frac{\partial \vec{A}}{\partial t}$ (2) $\vec{B} = \vec{\nabla} \times \vec{A}$

(3) $\vec{E} = - \vec{\nabla} V$ (4) $\vec{\nabla} \cdot \vec{A} + \mu_0 \epsilon_0 \frac{\partial \vec{A}}{\partial t} = 0$

107. In metals the skin depth for electromagnetic waves :

(1) increases with increase in frequency

(2) increases with increase in conductivity

(3) decreases with increase in frequency

(4) does not dpend on frequency

108. The dominant mode in a rectangular wave guide is :

(1) TE_{01} (2) TE_{10} (3) TM_{01} (4) TM_{10}

109. A lossless transmission line has characteristic impedance 70 Ω and phase constant 3rad/m at frequency of 100 MH_3. Find the capacitance per meter :

(1) 68.2 pF/M (2) 82.6 pF/M

(3) 56.3 pF/M (4) 47.8 pF/M

110. Indicate the false statement about the displacement current density :

(1) Its concept was given by Maxwell

(2) Its value is given by $\frac{\partial D}{\partial t} = Ja$

(3) It can flow even in free space where charge density is zero

(4) Its concept was derived from the thought that the changing electric field should produce magnetic field

111. In a certain medium the electric field of an electromagnetic wave is given by $\vec{E} = 10 \sin (10^8 t - 3y)^n \hat{a}_x$ volt/meter, where $\hat{a}_x$ is the unit vector along x direction, what type of medium is it ?

(1) Free space (2) Conductor

(3) Dielectric (4) Lossless dieletric

112. For a plane polarized wave passing through a medium it is found that the electric vector $\vec{E}$ leads the magnetic vector $\vec{H}$ by $\frac{\pi}{4}$. The medium is :

(1) Free space

(2) Dielectric

(3) Low pressure ionized gas (plasma)

(4) Metal

113. For a transistor the value of $h_{fe} = 49$ then the value of h_{fb} will be :

(1) 0.50 (2) 0.96 (3) 0.98 (4) 0.2

114. If a silicon chip doped with Arsenic is heated and its temperature starts increasing from room temperature then its resistance :

(1) increases

(2) first increases then decreases

(3) remains unchanged

(4) decreases

115. If a P.N junction diode is reverse biased then its depletion width :

(1) increases

(2) decreases

(3) remains unchanged

(4) first increases then decreases

116. In the frequency response of R.C. Coupled C.E. amplifier the upper cutoff frequency is obtained due to :

(1) blocking capacitance (2) bypass capacitance

(3) *junction* capacitance (4) decoupling capacitance

117. Indicate the false statement about the advantages of full wave rectefier over half wave rectifier.

(1) ripple factor is small

(2) peak inverse voltage is large

(3) rectification efficiency is large

(4) transformer loss is small

118. Find the concentration of donor atoms in N type silicon whose conductivity is 480 simons/meter. It is given that the mobility of electrons in N type silicon is $0.38 m^2/volt\text{-}sec$ and electronic charge is 1.6×10^{-19} coulomb.

(1) $7.9 \times 10^{21}/m^3$ (2) $8.7 \times 10^{20}/m^3$

(3) $5.7 \times 10^{21}/m^3$ (4) $6.3 \times 10^{20}/m^3$

119. What guide wavelength does $3GH_3$ radiation exihibit for dominant mode in rectangulor waveguide whose width is 6cm.

(1) 12 cm (2) 15 cm (3) 18 cm (4) 10 cm

120. An observer is at a very large distance r from anmonocharomatic point light source whose power output is P_0 and which radiates uniformly in all directions. Find the magnitude of electric field assuming that at large distances it behaves like plane electrcomagnetic wave.

(1) $\frac{1}{r}\sqrt{\frac{\mu_0 P_0}{2\pi C}}$ (2) $\frac{1}{r}\sqrt{\frac{\mu_0 P_0}{4\pi C}}$

(3) $\frac{1}{r}\sqrt{\frac{P_0 \mu_0 C}{2\pi}}$ (4) $\frac{1}{r}\sqrt{\frac{P_0 \mu_0 C}{4\pi}}$

121. Indicate the wrong relation among the four Maxwell's relations given below :

(1) $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$ (2) $\left(\frac{\partial S}{\partial P}\right)_T = \left(\frac{\partial V}{\partial T}\right)_P$

(3) $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_V$ (4) $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$

122. In thermodynamics the Gebb's function G is defined as :

(1) $G = u + PV + TS$ (2) $G = u - PV - TS$

(3) $G = u - PV + TS$ (4) $G = u + PV - TS$

123. Indicate the false conclusion drawn directly from the third law of thermodynamics :

(1) At abosolute zero specefic heats at constant pressure and constant volume are equal.

(2) Heat capacity vanishes at absolute zero

(3) Coefficent of valume expansion vanishes at absolute zero

(4) Absolute temperature is unattainable by a finite change of parameters.

124. If 1 Kg of water at 0°C is mixed with 1 Kg of water at 100°C. The change in the entropy of the system is :

(1) 24 Cal/Ok (2) 48 Cal/Ok

(3) 36 Cal/Ok (4) 144 Cal/Ok

125. The statement that the ratio of the emissive power to the obsorptive power for radiation of a given wavelength is the same for all bodies at the same temperature" is known as :

(1) Stefan's law (2) Newton's law

(3) Kirchhaff's law (4) Wien's law

126. The change in the boiling point of water when the pressure is increased by 10^6 dynes/cm^2, on assuming, that normal boiling point of water is 100°C, specific volume of steam is 1677 CC/gm and latent heat of vaporization is 540 cal/gm, will be about :

(1) 28°C (2) 7.5°C (3) 15°C (4) 42°C

127. S-T diagram can be plotted for :

(1) irreversible processes only

(2) reversible processes only

(3) Both for reversible and irreversieble processes

(4) Throtlling processes only

128. At what angle of incidence should a beam of sodion light be incident on the surface of diamond to produce completely polarized reflected light ? The critical angle for diamond is 24.5° :

(1) 36.5° (2) 54.5° (3) 67.5° (4) 45.5°

129. The work function of tungston is 5.4 eV when its surface is illuminated by the light of 175 nm the maximum energy of the photoelectrons will be (given h = 6.63×10^{-34} Joule-sec) :

(1) 1.4 eV (2) 1.3 eV (3) 1.5 eV (4) 1.7 eV

130. Find the shortest wavelength present in the radiation from an X ray machine whose operating potential is 50 kilo volt ($e = 1.6 \times 10^{-19}$ coulomb) :

(1) 0.05 nm
(2) 0.0156 nm
(3) 0.0248 nm
(4) 0.03 nm

131. X rays of wavelength 10.0 pm are scattered from a target. Find the maximum kinectic energy of the recoil electrons :

(1) 6.54×10^{-15} Joule
(2) 3.27×10^{-15} Joule
(3) 8.54×10^{-12} Joule
(4) 4.27×10^{-12} Joule

132. The de-Broglie wavelength of an electron moving with a velocty of $v = 10^5$ m/sec is (given mass of the electon = 9.1×10^{-31} kg and $h = 6.63 \times 10^{-34}$ Joule-sec)

(1) 5.3×10^{-9} m
(2) 7.3×10^{-9} m
(3) 3.65×10^{-11} m
(4) 6.9×10^{-11} m

133. Some of the conclusions drawn from Michelson-Marley experiment are given below. Indicate the conclusion which is not correct :

(1) The ether does not exist
(2) The light waves does not require a material medium for its propagation
(3) A fixed frame of reference does not exist
(4) All motion is relative to a universal frame of reference

134. Indicate the wrong statement about the Raman effect :

(1) It is due to the exchange of energy between the incident light photon and molecules of the medium.
(2) In the scattered light extra frequencies are $\upsilon \pm \upsilon_1$, $\upsilon \pm \upsilon_2$, $\upsilon \pm \upsilon_3$..... where υ is the original frequency :
(3) Shift in frequency $\upsilon_1, \upsilon_2, \upsilon_3$ .....depends on the original frequency υ
(4) Shift in frequency depends on the nature of the scattering material.

135. Which element has a $K_\alpha X$ ray line whose wavelength is 0.180 nm (Rydberg constant R = 1.097×10^{-7} m^{-1})

(1) Cobalt (2) Nickel

(3) Magnese (4) Iron

136. Indicate the false statement about the Ruby Laser :

(1) It consists of a ruby rod, with ends made precisely flat

(2) Ruby rod is a long ruby crystal doped with chromium

(3) It is surrounded by a cylendrical reflector and a coolant

(4) It is also surrounded by a spiral neon flash lamp acting as a pump.

137. Find the thickness of a quarter wave plate for light of wavelength 6000 A^0 (given that μ_0 = 1.544, and μ_e = 1.553)

(1) 8.33×10^{-4} cm (2) 16.67×10^{-4} cm

(3) 33.24×10^{-4} cm (4) 4.17×10^{-4} cm

138. A plane polarized light is incident on a thin uniaxial crystal cut parallel to optic axis such that the plane of vibration of the incident light makes an angle of 45^0 with the principal plane and the crystal is of thickness which produces a phase difference of $\frac{\pi}{2}$ between ordinary and sxtra ordinary beams the emergent light will be :

(1) elliptically polarized

(2) Plane polarized with sameplane of vibration

(3) circularly polarized

(4) plane polarized with plane of viberation rotated by 90^0

139. Apiece of coaxial cable has a characteristic impedance of 75 ohms and a nominal capacitance of 40pF/m. Find the inductance permeter.

(1) 0.225 μH (2) 0.525 μH

(3) 0.125 μH (4) 0.500 μH

140. N- type semiconductor is formed by doping Si or Ge with :

(1) Gallium and Arsenic (2) Phosphorous and Arsenic

(3) Aluminium and Antimoney (4) Phosphorous and Boron

141. Common emitter amplifier is used as an amplifier in intermediate stages in multistage amplifier because :

(1) its voltage gain is high

(2) Its current gain is high

(3) its input impedance and output impedance both are of medium value (kilo ohms)

(4) its input impedance is very high and output impedance is very low.

142. If an electron is injected into a uniform magnetic field $\vec{B}$ with velocity $\vec{V}$ making an angle 45° with the direction of $\vec{B}$ then its path would be :

(1) circle (2) parabola

(3) hyperbola (4) helix

143. A slabe of glass placed in air :

(1) radiates more heat than it receives from surrounding

(2) radiates as much as it receives from surrounding

(3) radiates less than it receives from surrounding

(4) does not radiate at all

144. When white light source is used in the Young's double slet experement the colour of bright fringes on both sides of the central fring is :

(1) violet (2) green (3) yellow (4) red

145. If two electric heaters rated P_1 and P_2 watts at 220 volt are connected in parallel across an electric supply of 220 V then the total power drawn would be :

(1) $\frac{P_1P_2}{P_1+P_2}$ (2) $\frac{P_1+P_2}{P_1P_2}$ (3) $P_1 + P_2$ (4) $\frac{P_1+P_2}{2}$

146. The series of spectral lines in the spectrum of hydrogen atom that lies partly in the ultraviolet and partly in the visible region is called :

(1) Lyman Series
(2) Brackett Series
(3) Paschen Series
(4) Balmer Series

147. The largest and the smallest distances of a satellite from the center of earth in its orbit are r_1 and r_2 respectively. Its distance from the center of earth in its orbit will be :

(1) $\frac{r_1 + r_2}{2}$ (2) $\frac{r_1 + r_2}{4}$ (3) $\frac{2r_1r_2}{r_1 + r_2}$ (4) $\frac{r_1r_2}{r_1 + r_2}$

148. Laser cooling of atoms is produced due to :

(1) absorption of photons by atoms
(2) scattering of photons by atoms
(3) transfer of momentum from photons to atoms
(4) transfer of energy from photons to atoms

149. In a transistar the dopent concentration is :

(1) least in the emitter
(2) least in the base
(3) least in the collector
(4) same in the base and collector

150. The magnification of the image formed by a concave mirror of focal length f is m. If the image is real the distance of the object from the mirror should be :

(1) mf
(2) (m + 1) f
(3) $\frac{m-1}{m}f$
(4) $\frac{m+1}{m}f$

ROUGH WORK
रफ़ कार्य

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली-काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 30 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।
2. परीक्षा भवन में ***लिफाफा रहित प्रवेश-पत्र के अतिरिक्त,*** लिखा या सादा कोई भी खुला कागज साथ में न लायें।
3. *उत्तर-पत्र अलग से दिया गया है। इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा। केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।*
4. अपना अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से निर्धारित स्थान पर लिखें।
5. *उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।*
6. *ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्नपुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्नपुस्तिका पर अनुक्रमांक और ओ० एम० आर० पत्र संख्या की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।*
7. *उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।*
8. *प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिए आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।*
9. प्रत्येक प्रश्न के उत्तर के लिए केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।
10. *ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का उत्तर नहीं देना चाहते हैं, तो संबंधित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।*
11. रफ कार्य के लिए प्रश्न-पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा उत्तर-पुस्तिका के अंतिम पृष्ठ का प्रयोग करें।
12. परीक्षा के उपरान्त केवल ***ओ एम आर उत्तर-पत्र*** परीक्षा भवन में जमा कर दें।
13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।
14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की, भागी होगा/होगी।