RJ VISION Pvt. Ltd.

Pioneer in Coaching For AIPMT(NEET) | JEE | PFC | NTSE | KVPY | OLYMPIAD

Code
A

JEE – 3

(JEE – 3 FULL COURSE SOLUTION)

TEST ID : 303

TIME : 3 HR MM : 360 This Booklet contains **3** pages

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and Fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **90** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **360. [As per New Pattern]**
3. Use **Blue/Black Ball point pen only** for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must handover the Answer Sheet to the invigilator in the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **A.** Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklets and the Answer Sheets
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your roll no. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate, must show on demand his/her Admission Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. Cases where a candidate has not signed the Attendance Sheet the second time will be deemed not to have handed over Answer Sheet and dealt with as an unfair means case.
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Regulations of the Board.
14. No part of the Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Do not open this Test Booklet until you are asked to do so.

Name of the Candidate (in Capitals) : ______________________________

Roll Number : ______________________________

School : ______________________________

Centre of Examination (in Capitals) (Vasna / Karelibaug/ / Others) ______________

Candidate's Signature : ____________________ **Invigilator Signature :** ________________

ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A.	**2**	**4**	**3**	**2**	**4**	**3**	**4**	**1**	**4**	**1**	**2**	**4**	**4**	**1**	**1**
Q	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A.	**4**	**3**	**2**	**4**	**1**	**2**	**4**	**3**	**2**	**4**	**2**	**2**	**4**	**2**	**2**
Q.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
A.	**4**	**2**	**2**	**1**	**1**	**1**	**3**	**4**	**3**	**1**	**3**	**2**	**4**	**2**	**4**
Q.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
A.	**2**	**4**	**2**	**2**	**3**	**2**	**2**	**1**	**2**	**4**	**2**	**2**	**2**	**1**	**3**
Q.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
A.	**2**	**3**	**3**	**3**	**2**	**2**	**4**	**1**	**4**	**2**	**3**	**1**	**2**	**4**	**2**
Q.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
A.	**3**	**1**	**3**	**2**	**3**	**1**	**1**	**2**	**4**	**4**	**1**	**2**	**2**	**2**	**2**

HINT – SHEET

11. $\dfrac{t}{T_h} = \dfrac{48\text{ day}}{16\text{ day}} = 3$

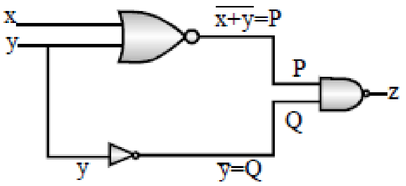
$\Rightarrow R = \dfrac{R_0}{2^{t/T_h}} = \dfrac{800}{2^3} = 100$ count

12. ${}_7N^{15} + {}_2He^4 \longrightarrow [{}_9F^{19}] \longrightarrow {}_8O^{18} + {}_1H^1$

13. $\dfrac{\lambda_p}{\lambda_\alpha} = \sqrt{\dfrac{m_\alpha q_\alpha v_\alpha}{m_p q_p v_p}} = \sqrt{\dfrac{4m_p \times 2e \times \frac{v}{4}}{m_p \times e \times v}} = \dfrac{\lambda}{\lambda_\alpha}$

$\sqrt{2} = \dfrac{\lambda}{\lambda_\alpha} \quad \Rightarrow \lambda_\alpha = \dfrac{\lambda}{\sqrt{2}}$

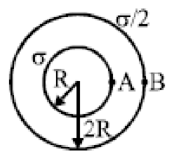
14.



$Z = \overline{P.Q} = \overline{P} + \overline{Q} = \overline{\overline{x+y}} + \overline{\overline{y}} = x + y + y = x + y$

Arrangement will behave like OR gate.

16.



Potential at point A

$V_A = \dfrac{k(\sigma \times 4\pi R^2)}{R} + \dfrac{k\left(\frac{\sigma}{2} \times 4\pi \times 4R^2\right)}{2R}$

$V_A = 8\pi k\sigma R$

Potential at point B

$V_B = \dfrac{k(\sigma \times 4\pi R^2)}{2R} + \dfrac{k\left(\frac{\sigma}{2} \times 4\pi \times 4R^2\right)}{2R}$

$= 2\pi k\sigma R + 4\pi k\sigma R = 6\pi k\sigma R$

$\dfrac{V_A}{V_B} = \dfrac{8\pi k\sigma R}{6\pi k\sigma R} = \dfrac{4}{3}$

23. $dQ = dU + dW$

$2625 \times J = 5000 + 200 \times 10^3 \times (0.05 - 0.02)$

$J = \dfrac{5000 + 200 \times 10^3 \times 0.03}{2625} = 4.19$ Joul/cal

SPACE FOR ROUGH WORK

24. $V_{av} = \sqrt{\dfrac{8RT}{\pi M}} = 11.2$ kw/sec

$\sqrt{\dfrac{8 \times 8.3 \times T}{3.14 \times 2 \times 10^{-3}}} = 11.2 \times 1000$

$T = 11800$ K

27. Formula used

$eV_s = h\nu - \phi$

case I $e(6V_0) = h\nu - \phi$ ...(i)

Case II $e(6V_0 - 4V_0) = \dfrac{h\nu}{2} - \phi$

$\Rightarrow e(2V_0) = \dfrac{h\nu}{2} - \phi$ ...(ii)

eq (i) – 3 × eq.(ii)

$0 = \left(h\nu - \dfrac{3h\nu}{2}\right) - \phi + 3\phi$

$\Rightarrow \dfrac{h\nu}{2} = 2\phi \qquad \Rightarrow \phi = \dfrac{h\nu}{4}$

$\Rightarrow v_0 = \dfrac{v}{4}$

28. Current gain $\beta = \dfrac{\alpha}{1-\alpha} = \dfrac{0.96}{1-0.96} = 24$

$I_C = \dfrac{0.8V}{500\Omega} = 1.6$ mA

$\therefore I_\beta = \dfrac{I_c}{\beta} = \dfrac{1.6}{24}$mA $= 0.067$mA

30. $f = \dfrac{mD}{(1+m)^2} = \dfrac{4 \times 25}{(1+4)^2} = \dfrac{100}{25} = 4$ cm

54. $\therefore K_a = C\alpha^2$

$\therefore \alpha = \sqrt{\dfrac{K_a}{C}} = \sqrt{\dfrac{8 \times 10^{-3}}{0.2}} = \sqrt{4 \times 10^{-2}}$

$\therefore \alpha = 0.2$

$\because i = 1 + (n-1)\alpha \quad (HX \rightleftharpoons H^+ + X^-)$

$\therefore i = 1 + (2-1)\alpha = 1 + \alpha$

$\therefore i = 1 + 0.2 = 1.2$

$\pi = iCST = 1.2 \times 0.2 \times 0.0821 \times 300$

$= 5.91$ atm

61. $\lim_{x\to\infty}\left[(a+b)\left(1-\left(\dfrac{c}{a+b}\right)^x\right)^{1/x} + (b+c)\left(1-\left(\dfrac{a}{b+c}\right)^x\right)^{1/x} + (c+a)\left(1-\left(\dfrac{b}{c+a}\right)^x\right)^{1/x}\right]$

$= (a+b)(1-0)^\circ + (b+c)(1-0)^\circ + (c+a)(1-0)^\circ$

$= 2(a+b+c) = 6$

62. $f(|x|) = \begin{cases} \sin|x| & ; |x| < 0 \\ \cos(x) - \big||x|-1\big| & ; |x| \ge 0 \end{cases}$

$\Rightarrow f(|x|) = \cos x - \big||x|-1\big| \;\; ; x \in R$

($\because$ $|x| < 0$ is not possible)

$\Rightarrow f(|x|) = \cos x - \big||x|-1\big| \;\; ; x \in R$

Which is non differentiable at $x = 0$ and when $|x| - 1 = 0$ or $x = \pm 1$

Hence $f(|x|)$ has exactly three points of non-differentiability.

63. $f(0) = 0 + 0 + \lambda \ell n4 = \lambda \ell n4$

R.H.L. $= \lim_{x\to 0^+} f(x) = \lim_{h\to 0} f(0+h)$

$= \lim_{h\to 0} \dfrac{8^h - 4^h - 2^h + 1}{\sin^2 h}$

$= \lim_{h\to 0}\left(\dfrac{4^h-1}{h}\right)\left(\dfrac{2^h-1}{h}\right)\cdot\left(\dfrac{h^2}{\sin^2 h}\right)$

$= \ell n4 . \ell n2 . 1^2$

Now $\lambda \ell n4 = \ell n4 . \ell n2$

$\Rightarrow \lambda = \ell n2$

64. $x^2 f'(x)\Big]_0^1 - \int_0^1 2x.f'(x)dx$

$\Rightarrow 1.f'(1) - 0 - 2\left[xf(x) - \int 1f(x)\right]_0^1$

$\Rightarrow f'(1) - 2[1f(1)] + 2\int_0^1 f(x)dx$

$\Rightarrow 2 - 2(3) + 2.5 = 12 - 6 = 6$

SPACE FOR ROUGH WORK

65. $\int_a^c f(x)dx = \int_a^b f(x)dx + \int_b^d f(x)dx + \int_d^c f(x)dx$

$= 3 + 5 + 2 = 10$

66. $x = \tan\theta$

$$\int \frac{\tan^2\theta.\sec^2\theta d\theta}{(1+\tan^2\theta)(1+\sec\theta)} = \int \frac{\tan^2\theta}{1+\sec\theta}d\theta$$

$$= \int \frac{\sin^2\theta}{\cos\theta(1+\cos\theta)}d\theta = \int \frac{1-\cos\theta}{\cos\theta}$$

$$= \int (\sec\theta - 1)d\theta = \log|\sec\theta + \tan\theta| - \theta + C$$

$$= \log\left|x + \sqrt{1+x^2}\right| - \tan^{-1}x + C$$

$\because$ $f(0) = 0$

$\therefore$ $C = 0$

Thus $f(1) = \log(1+\sqrt{2}) - \frac{\pi}{4}$

80. Let $P(n) : 10^n + 3.4^{n+2} + \lambda$

$P(1) : 10 + 3.4^3 + \lambda = 202 + \lambda$

$= 9 \times 22 + (4 + \lambda)$

So, P(1) is exactly divisible by 9 when $4 + \lambda = 0$

Therefore $\lambda = -4$

81. Eq. of planes

$x - cy - bz = 0$ ...... (1)

$cx - y + az = 0$ ...... (2)

$bx + ay - z = 0$ ...... (3)

Eq^n of line passing through (1) & (2)

$$\frac{x-0}{-ac-b} = \frac{y-0}{-a-bc} = \frac{z-0}{-1+c^2} = K \text{ ..... (4)}$$

Any pt. on line (4) will satisfy (3) so,

$-K(abc + b^2 + a^2 + abc + c^2 - 1) = 0$

$\Rightarrow a^2 + b^2 + c^2 + 2abc = 1$

82. Eq^n. of plane through mid point of A(1,2,3) & B(–3,4,5) is

$a(x + 1) + b(y - 3) + c(z - 4) = 0$ &

$a = 1 - (-3)$

$b = 2 - 4$

$c = 3 - 5$

$\therefore$ Plane is $4x + 4 - 2y + 6 - 2z + 8 = 0$

$2x - y - z = -9$

Intercept $\equiv \left(-\frac{9}{2}, 9, 9\right)$

83. $|PQ| = \sqrt{(2-3)^2 + (3+4)^2 + (-6-5)^2} = \sqrt{171}$

$\Rightarrow$ DC's of PQ $= \frac{1}{\sqrt{171}}, \frac{-7}{\sqrt{171}}, \frac{11}{\sqrt{171}}$

84. $\left|(\vec{a} \times \vec{b}).\vec{c}\right| = |a|\,|b| \sin\theta\, |c| \cos\phi$ ...... (1)

Where θ is angle between $\vec{a}$ and $\vec{b}$ & ϕ is angle between $(\vec{a} \times \vec{b})$ & $\vec{c}$, Now eq^n. (1) will be equal to |a| |b| |c| when $\theta = 90°$ & $\phi = 0°$ i.e. when $\vec{a}$ is $\perp^r$ to $\vec{b}$ & $\vec{c}$ is || to a vector which is $\perp^r$ to $\vec{a}$ & $\vec{b}$ i.e.

$\vec{a}.\vec{b} = \vec{b}.\vec{c} = \vec{a}.\vec{c} = 0$

89. $a\hat{x} + a\hat{y} + c(\hat{x} \times \hat{y})$

$1.\hat{x} + 0.\hat{y} + 1.(\hat{x} \times \hat{y})$

$c\hat{x} + c\hat{y} + b(\hat{x} \times \hat{y})$

are coplanar if

$$\begin{vmatrix} a & a & c \\ 1 & 0 & 1 \\ c & c & b \end{vmatrix} = 0$$

$\Rightarrow$ $a(0 - c) - a(b - c) + c(c - 0) = 0$

$\Rightarrow$ $-ac - ab + ac + c^2 = 0$

$\Rightarrow$ $c^2 = ab$

i.e. c is the GM of a and b

SPACE FOR ROUGH WORK