

MODEL QUESTION PAPER – 4

with Detailed Solutions

1. If atleast one eigen value is zero and the remaining are negative then the quadratic form is

- 1) positive definite
- 2) negative definite
- 3) positive semidefinite
- 4) negative semidefinite

2. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$ is

- 1) 0 2) 2
- 3) 1 4) 3

3. A square matrix A is said to be non-singular if
 1) 0 2) $|A|=0$

- 3) $|A|\neq 0$ 4) Scalar matrix

4. If A is a non singular matrix of order 4 then
 Rank of A =

- 1) 3 2) 4
- 3) 2 4) 1

5. If three points (x_r, y_s) , $r= 1, 2, 3$ are vertices

of an equilateral triangle then $\begin{bmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{bmatrix}$ has rank

- 1) 2 2) 1
- 3) 3 4) 0

6. The function $f(x, y)$ has a maximum at (a, b)

if $\left(\frac{\partial f}{\partial y}\right) = 0, \frac{\partial f}{\partial y}=0$ and

$$1) \frac{\partial^2 f}{\partial x^2} \cdot \frac{\partial^2 f}{\partial y^2} + \frac{\partial^2 f}{\partial x \partial y} = 0 \text{ and } \frac{\partial^2 f}{\partial x^2} < 0$$

$$2) \frac{\partial^2 f}{\partial x^2} \cdot \frac{\partial^2 f}{\partial y^2} - \left(\frac{\partial^2 f}{\partial x \partial y}\right)^2 > 0 \text{ and } \frac{\partial^2 f}{\partial x^2} < 0$$

$$3) \frac{\partial^2 f}{\partial x^2} \cdot \frac{\partial^2 f}{\partial y^2} - \left(\frac{\partial^2 f}{\partial x \partial y}\right)^2 > 0 \text{ and } \frac{\partial^2 f}{\partial x^2} > 0$$

$$4) \frac{\partial^2 f}{\partial x^2} \cdot \frac{\partial^2 f}{\partial y^2} - \frac{\partial^2 f}{\partial x \partial y} > 0$$

7. Solve: $p \tan x + q \tan y = \tan z$

$$1) f(\tan x, \tan y) = 0$$

$$2) f(\cos x, \cos y) = 0$$

$$3) f\left(\frac{\sin x}{\sin y}, \frac{\sin y}{\sin z}\right) = 0$$

$$4) f\left(\frac{\cos x}{\cos y}, \frac{\cos y}{\cos z}\right) = 0$$

8. Particular integral of $(D^2 + 16)y = \cos 4x$ is

- 1) $\frac{x}{8} \cos 4x$
- 2) $\frac{x}{8} \sin 4x$
- 3) $x \cos 4x$
- 4) $x \sin 4x$

9. Particular integral of $(D^2 + 1)y = e^{-x}$ is

- 1) $\frac{e^x}{2}$
- 2) $\frac{e^{-x}}{2}$
- 3) $\frac{e^{-x}}{-2}$
- 4) $\frac{e^x}{-2}$

10. If $z = \log(e^x + e^y)$ then $\frac{\partial^2 f}{\partial x^2} \cdot \frac{\partial^2 f}{\partial y^2} - \left(\frac{\partial^2 z}{\partial x \partial y}\right)^2 =$

- 1) 4
- 2) 3
- 3) 2
- 4) 0

11. If $ax + by + cz = k$ where a, b, c are constants, then $\iint_S \vec{F} \cdot \hat{n} ds$ where S is the surface of the unit sphere is

- 1) $(a+b+c)$
- 2) $p(a+b+c)$
- 3) $\frac{4\pi}{3}(a+b+c)$
- 4) 0

12. Find the directional derivative of $\phi = 2xy + 5yz + zx$ at the point $(1, 2, 3)$ in the direction $3i - 5j + 4k$

- 1) $-2\sqrt{2}$
- 2) $\sqrt{2}$
- 3) $3\sqrt{2}$
- 4) $2\sqrt{2}$

13. The value of $\int_C 5ydx + 6xdy$ over the circle $x^2 + y^2 = 1$

- 1) 3π
- 2) 4π
- 3) π
- 4) π^2

14. $\iiint_V dv =$

- 1) Volume of the given surface
- 2) Area of cross section
- 3) 1
- 4) 0

15. Evaluate: $\int_C \frac{z^4 + z^3 + z^2 + z + 1}{z+4} dz$ where C is the circle $|z| = 1$

- 1) 2 2) $2\pi i$
 3) $4\pi i$ 3) 0
16. Evaluate $\int_C \frac{z^3 - 3}{(z-2)^3} dz$ where c is the circle $|z| = 3$
 1) πi 2) $2\pi i$
 3) $12\pi i$ 4) 0
17. The Image of the circle $|z-1|=1$ In the complex plane under the mapping $w = \frac{1}{z}$
 1) straight line 2) circle
 3) square 4) ellipse
18. Find the residue at $z = \frac{\pi}{2}$ for $f(z) = \tan z$
 1) 0 2) 1
 3) -1 4) 2
19. Singularity of ze^{1/z^3} at $z=0$ is of the type
 1) isolated singularity
 2) removable singularity
 3) essential singularity
 4) isolated and removable singularities
20. Let $L\left[\frac{\sin at}{t}\right] = \tan^{-1}\left(\frac{a}{s}\right)$ then $\int_0^\infty \frac{\sin t}{t} dt = 0$
 1) at 2) st
 3) $\pi/2$ 4) 0
21. Find $L^{-1}\left(\frac{1}{s^2+4}\right)$
 1) $\frac{\sin 2t}{2}$ 2) $\frac{\cos 2t}{2}$
 3) $\frac{1}{\cos t}$ 4) $\frac{1}{\sin 2t}$
22. By evaluating $\int_0^1 \frac{dx}{1+x^2}$ by a numerical integration method we obtain an approximate value of
 1) $\log e^2$ 2) $\pi/4$
 3) e 4) $\log 100$
23. The scheme
 $\int_a^{a+2h} f(x) dx = \frac{h}{3} [f(a) + 4f(a+b) + f(a+2b)]$
 is
 1) Trapezoidal rule 3) Simpson's rule
 2) Simpson's rule 4) Weddle's rule
24. Find the z transform of 2^k , $k \geq 0$
 1) $\frac{z}{z-2}$, $|z| > 2$ 2) $\frac{z}{z+2}$, $|z| < 2$
 3) $\frac{z}{z+1}$, $|z| < 1$ 4) $\frac{z}{z-1}$, $|z| > 1$
25. A is known to hit the target in 2 out of 5 shots where B is known to hit the target in 3 out of 4 shots. Find the probability of the target being hit when they both try?
 1) $\frac{1}{20}$ 2) $\frac{3}{20}$
 3) $\frac{11}{20}$ 4) $\frac{17}{20}$
26. Three machines I, II and III manufacture respectively 0.4, 0.5 and 0.1 of the total production. The percentage of defective items produced by I, II and III is 2, 4 and 1 percent respectively. For an item is chosen at random. What is the probability it is defective?
 1) 0.029 2) 0.29
 3) 0.1124 4) 0.322
27. A manufacturer knows that the condensers he makes contain on the average 1% of defectives. He packs them in boxes of 100. What is the probability that a box picked at random will contain 3 or more faulty condensers.
 1) 0.08025 2) 0.00931
 3) 0.01413 4) 0.2848
28. M.G.F. of normal distribution is
 1) $e^{\mu t + \frac{\sigma^2 t^2}{2}}$ 2) $e^t + e^{\mu^2 \sigma^2}$
 3) $e^{\mu t} + e^{\mu^2 \sigma^2}$ 4) $e^{\mu t^2 - \sigma^2}$
29. With the usual notation find 'P' for a binomial random variable X if n = 6 and $9P(X=4)=P(X=2)$
 1) $\frac{1}{2}$ 2) $\frac{1}{3}$
 3) $\frac{1}{4}$ 4) $\frac{1}{5}$
30. A urn contains nine balls two of which are red, three blue and four black. Three balls are drawn from the urn at random. What is the probability, that the three balls are of different colours?
 1) $\frac{1}{7}$ 2) $\frac{3}{7}$
 3) $\frac{2}{7}$ 4) $\frac{5}{7}$

ANSWERS

1. 4	2. 3	3. 3	4. 2	5. 3	6. 2	7. 3	8. 2	9. 2	10. 4
11. 3	12. 1	13. 3	14. 1	15. 4	16. 3	17. 1	18. 3	19. 3	20. 3
21. 1	22. 2	23. 2	24. 1	25. 4	26. 1	27. 1	28. 1	29. 3	30. 3

DETAILED SOLUTIONS

1. (4)

If atleast one eigen value is zero and the remaining are negative then the quadratic form is Negative Semidefinite.

2. (3)

Clearly $|A| = 0$

Also determinant of any submatrix of order 2 is 0.

Also A is not a zero matrix

\therefore Rank = 1

3. (3)

A square matrix A is non-singular if $|A| \neq 0$

4. (2)

If A is a nonsingular matrix of order 4, then rank of A = 4

5. (3)

(x_r, y_r) $r=1, 2, 3$ are vertices of a triangle area of the triangle $\nabla \neq 0$

New area of the triangle

$$= \frac{1}{2} \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} \neq 0$$

$$\Rightarrow \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} \neq 0$$

$$\Rightarrow \text{Rank of } \begin{bmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{bmatrix} \text{ is 3}$$

6. (2)

The function $f(x, y)$ has a maximum at (a, b) if

$$\frac{\partial f}{\partial x} = 0, \frac{\partial f}{\partial y} = 0 \text{ and } \frac{\partial^2 f}{\partial x^2} \cdot \frac{\partial^2 f}{\partial y^2} - \left(\frac{\partial^2 f}{\partial x \partial y} \right)^2 > 0$$

$$\text{and } \frac{\partial^2 f}{\partial x^2} < 0$$

7. (3)

$$P \tan x + Q \tan y = \tan z$$

Solution is given by

$$\frac{dx}{\tan x} = \frac{dy}{\tan y} = \frac{dz}{\tan z}$$

From first two equations

$$\frac{dx}{\tan x} = \frac{dy}{\tan y} \Rightarrow \int \frac{dx}{\tan x} = \int \frac{dy}{\tan y} = \int c_1 dx = \int c_2 dy$$

$$\Rightarrow \frac{\sin x}{\sin y} = c_1 = \log \sin x = \cos x \sin y + \cos c$$

From last two equations

$$\int \frac{dy}{\tan y} = \int \frac{dz}{\tan z}$$

$$\Rightarrow \log \sin y = \log \sin z + \log c_2$$

$$\Rightarrow \frac{\sin y}{\sin z} = c_2$$

\therefore solution is

$$\Rightarrow f \left(\frac{\sin x}{\sin y}, \frac{\sin y}{\sin z} \right) = 0$$

8. (2)

Formula:

$$\text{P.I. of } (D^2 + a^2)y = \cos ax \text{ is } \frac{\cos ax}{D^2 + a^2} = \frac{x \sin ax}{2a}$$

$$\text{P.I. of } (D^2 + 16) = \cos 4x$$

$$= \frac{x \sin 4x}{8}$$

9. (2)

$$\text{P.I.} = \frac{e^{-x}}{D^2 + 1} = \frac{e^{-x}}{(-1)^2 + 1} = \frac{e^{-x}}{2}$$

10. (4)

$$z = \log(e^x + e^y)$$

$$\frac{\partial z}{\partial x} = \frac{e^x}{e^x + e^y}$$

$$\frac{\partial^2 z}{\partial x^2} = \frac{(e^x + e^y)e^x - e^x \cdot e^x}{(e^x + e^y)^2}$$

$$= \frac{e^{x+y}}{(e^x + e^y)^2}$$

$$\frac{\partial z}{\partial y} = \frac{e^y}{e^x + e^y}$$

$$\frac{\partial^2 z}{\partial y^2} = \frac{e^{x+y}}{(e^x + e^y)^2}$$

$$\frac{\partial^2 z}{\partial x \partial y} = \frac{-e^y \cdot e^x}{(e^x + e^y)^2}$$

$$= \frac{-e^{y+x}}{(e^x + e^y)^2}$$

Now

$$\begin{aligned} & \frac{\partial^2 z}{\partial x^2} \cdot \frac{\partial^2 z}{\partial y^2} - \left(\frac{\partial^2 z}{\partial x \partial y} \right)^2 \\ &= \frac{e^{x+y}}{(e^x + e^y)^2} \cdot \frac{e^{x+y}}{(e^x + e^y)^2} - \left[\frac{e^{x+y}}{(e^x + e^y)} \right]^2 = 0 \end{aligned}$$

11. (3)

$$\begin{aligned} \nabla \cdot \vec{F} &= \left(i \frac{\partial}{\partial x} + j \frac{\partial}{\partial y} + k \frac{\partial}{\partial z} \right) (axi + byj + czk) \\ &= a + b + c \end{aligned}$$

By Gauss Divergence theorem

$$\begin{aligned} &= \iint_S \vec{F} \cdot \hat{n} ds = \iiint_V \nabla \cdot \vec{F} dv \\ &= \iiint_V (a + b + c) dv \\ &= (a + b + c) \iiint dv \\ &= (a + b + c) (\text{volume of the unit sphere}) \\ &= (a + b + c) \times \frac{4\pi}{3} (1)^3 \\ &= \frac{4(a + b + c)\pi}{3} \end{aligned}$$

12. (1)

$$\begin{aligned} \phi &= 2xy + 5yz + zx \\ \nabla \phi &= \left(i \frac{\partial}{\partial x} + j \frac{\partial}{\partial y} + k \frac{\partial}{\partial z} \right) (2xy + 5yz + zx) \\ &= (2y+z)i + (2x+5z)j + (5y+x)k \\ \nabla \phi(1, 2, 3) &= (2(2)+3)i + (2(1)+5(3))j + (5(2)+1)k \\ &= 7i + 17j + 11k \end{aligned}$$

\hat{e} = Unit vector in the direction of $3i - 5j + 4k$

$$= \frac{3i - 5j + 4k}{\sqrt{9 + 25 + 16}} = \frac{3i - 5j + 4k}{5\sqrt{2}}$$

\therefore Directional derivative

$$\begin{aligned} &= \nabla \phi \cdot \hat{e} \\ &= (7i + 17j + 11k) \cdot \left(\frac{3i - 5j + 4k}{5\sqrt{2}} \right) \\ &= \frac{21 - 85 + 44}{5\sqrt{2}} \\ &= \frac{-20}{5\sqrt{2}} = \frac{-4}{\sqrt{2}} = -2\sqrt{2} \end{aligned}$$

13. (3)

By Green's theorem

$$\begin{aligned} \iint_C M dx + N dy &= \iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) dx dy \\ &\therefore \int_c 5y dx + 6x dy \\ &= \iint_R \left(\frac{\partial(6x)}{\partial x} - \frac{\partial(5y)}{\partial y} \right) dx dy \\ &= \iint_R (6 - 5) dx dy \\ &= \iint_R dx dy \end{aligned}$$

Area of the circle $x^2 + y^2 = 1$

$$\begin{aligned} &\left[\because \iint_R dx dy = \text{Area of the curve } C \right] \\ &= (1)^2 = \pi(1)^2 \\ &= \pi \end{aligned}$$

14. (1)

$$\iiint_V dv = \text{volume of the given surface}$$

15. (4)

Cauchy's integral theorem:

If $f(z)$ is analytic and $f'(z)$ is continuous inside and on the curve C , then $\int_C f(z) dz = 0$

$$\text{Let } f(z) = \frac{z^4 + z^3 + z^2 + z + 1}{z + 4}$$

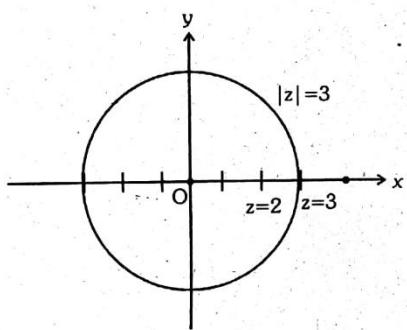
Clearly $f(z)$ is not analytic at $z = -4$

$z = -4$ lies outside the circle $|z| = 1$

\therefore By Cauchy's theorem

$$\begin{aligned} \int_C f(z) dz &= \int_C \frac{z^4 + z^3 + z^2 + z + 1}{z + 4} dz \\ &= 0 \end{aligned}$$

16. (3)



$$f(z) = z^3 - 3$$

$$f'(z) = 3z^2 - 1$$

$$f''(z) = 6z$$

By cauchy's integral formula

$$f''(a) = \frac{n!}{2\pi i} \int_C \frac{f(z)dz}{(z-a)^{n+1}}$$

$$\begin{aligned} \text{Now } \int_C \frac{z^3 - z}{(z-2)^3} dz &= \int \frac{f(z)dz}{(z-2)^3} \\ &= \frac{2\pi i}{2!} f''(2) \\ &= \frac{2\pi i}{2} \times 6 \times 2 \end{aligned}$$

$$= 12\pi i$$

17. (1)

$$\begin{aligned} w &= \frac{1}{z} \\ \Rightarrow u + iv &= \frac{1}{x+iy} \\ &= \frac{1}{x+iy} \times \frac{x-iy}{x-iy} \\ &= \frac{x-iy}{x^2+y^2} \\ u &= \frac{x}{x^2+y^2}; v = \frac{-y}{x^2+y^2} \end{aligned}$$

$$|z-1| = 1$$

$$\Rightarrow |x+iy-1| = 1$$

$$\Rightarrow |(x-1)+iy| = 1$$

$$\Rightarrow \sqrt{(x-1)^2 + y^2} = 1$$

$$\Rightarrow (x-1)^2 + y^2 = 1$$

$$\Rightarrow x^2 + y^2 - 2x = 0$$

$$\Rightarrow x^2 + y^2 = 2x$$

$$\Rightarrow \frac{x}{x^2 + y^2} = \frac{1}{2}$$

$$\Rightarrow u = \frac{1}{2}$$

$$\Rightarrow 2u - 1 = 0$$

The above equation is a straight line.

18. (3)

$$f(z) = \tan z$$

$$= \frac{\sin z}{\cos z}$$

$$\cos z = 0$$

$$\Rightarrow z = \frac{\pi}{2}$$

$$\text{Residue at } z = \frac{\pi}{2}$$

$$= \lim_{z \rightarrow \frac{\pi}{2}} \left(z - \frac{\pi}{2} \right) f(z)$$

$$\begin{aligned} &= \lim_{z \rightarrow \frac{\pi}{2}} \frac{\left(z - \frac{\pi}{2} \right) \sin z}{\cos z} \left(\frac{0}{0} \text{ form} \right) \\ &= \frac{\left(z - \frac{\pi}{2} \right) (\cos z) + \sin z}{-\sin z} \end{aligned}$$

(By L'Hospital's rule)

$$\begin{aligned} &= \frac{0 + \sin \frac{\pi}{2}}{-\sin \frac{\pi}{2}} \\ &= -1 \end{aligned}$$

19. (3)

Formula:

$$e^z = 1 + \frac{z}{1!} + \frac{z^2}{2!} + \frac{z^3}{3!} + \dots$$

$$\text{Let } f(z) = ze^{\frac{1}{z^3}}$$

$$\begin{aligned} &= z \left(1 + \frac{\left(\frac{1}{z^3}\right)}{1!} + \frac{\left(\frac{1}{z^3}\right)^2}{2!} + \frac{\left(\frac{1}{z^3}\right)^3}{3!} + \dots \right) \\ &= \left(z + \frac{1}{z^2} + \frac{1}{2z^5} + \frac{1}{6z^8} + \dots \right) \end{aligned}$$

Principal part (powers of $\frac{1}{z}$) contains infinite-number of terms. Therefore $z = 0$ is an essential singularity.

20. (3)

Formula:

$$L \left[\frac{\sin at}{t} \right] = \tan^{-1} \left(\frac{a}{s} \right)$$

$$\Rightarrow \int_0^\infty e^{-st} \left(\frac{\sin at}{t} \right) dt = \tan^{-1} \left(\frac{a}{s} \right)$$

Putting a=1 and s→0

$$\begin{aligned} \int_0^\infty \frac{\sin at}{t} dt &= \tan^{-1}(\infty) \\ &= \frac{\pi}{2} \end{aligned}$$

21. (1)

Formula:

$$L^{-1} \left(\frac{a}{s^2 + a^2} \right) = \sin at$$

Now

$$\begin{aligned} L^{-1} \left(\frac{1}{s^2 + 4} \right) &= \frac{1}{2} L^{-1} \left(\frac{2}{s^2 + 2^2} \right) \\ &= \frac{1}{2} \sin 2t \end{aligned}$$

22. (2)

$$\begin{aligned} \int_0^1 \frac{dx}{1+x^2} &= [\tan^{-1}(x)]_0^1 \\ &= \tan^{-1} 1 - \tan^{-1} 0 \\ &= \frac{\pi}{4} \end{aligned}$$

23. (2)

Simpson's $\frac{1}{3}$ rule

24. (1)

Formula

$$\begin{aligned} Z[f(k)] &= \sum_{k=-\infty}^{\infty} \frac{f(k)}{z^k} \\ \therefore Z(2^k) &= \sum_{k=0}^{\infty} \frac{2^k}{z^k} = \sum_{k=0}^{\infty} \left(\frac{2}{z} \right)^k \\ &= 1 + \frac{2}{z} + \left(\frac{2}{z} \right)^2 + \left(\frac{2}{z} \right)^3 + \dots \\ &= \frac{1}{1 - \frac{2}{z}} \text{ where } \left| \frac{2}{z} \right| < 1 \\ &= \frac{z}{z-2} \text{ where } |z| > 2 \end{aligned}$$

25. (4)

$$P(A) = \frac{2}{5}$$

$$P(B) = \frac{3}{4}$$

Probability of the target being hit when they both try =

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= P(A) + P(B) - P(A).P(B)$$

$$= \frac{2}{5} + \frac{3}{4} - \left(\frac{2}{5} \cdot \frac{3}{4} \right)$$

$$= \frac{2}{5} + \frac{3}{4} - \frac{6}{20}$$

$$= \frac{8 + 15 - 6}{20}$$

$$= \frac{17}{20}$$

26. (1)

Defective item produced by

$$\text{Machine I} = \frac{2}{100} \times 0.4 = \frac{0.8}{100}$$

Defective time produced by

$$\text{Machine II} = \frac{4}{100} \times 0.5 = \frac{2}{100}$$

Defective item produced by

$$\text{Machine III} = \frac{1}{100} \times 0.1 = \frac{0.1}{100}$$

Total defective items

$$= \frac{0.8}{100} + \frac{2}{100} + \frac{0.1}{100} = \frac{2.9}{100} = 0.029$$

$$\text{Required probability} = \frac{0.029}{1} = 0.029$$

27. (1)

$$p = 1\% = \frac{1}{100} = 0.01$$

$$\lambda = np = 100 \times 0.01 = 1$$

Poisson distribution $P(X=x)$

$$= \frac{e^{-\lambda} \lambda^x}{x!}$$

$P(x$ faulty condensers)

$$= \frac{e^{-1} 1^x}{x!} = \frac{e^{-1}}{x!}$$

$P(3\text{or more faulty condensers})$

$$= P(3) + P(4) + P(5) + \dots + P(100)$$

$$= 1 - [P(0) + P(1) + P(2)]$$

$$= 1 - \left(\frac{e^{-1}}{0!} + \frac{e^{-1}}{1!!} + \frac{e^{-1}}{2!} \right)$$

$$= 1 - e^{-1} \left(1 + 1 + \frac{1}{2} \right)$$

$$= 1 - e^{-1} \times 2.5$$

$$= 1 - 0.3679 \times 2.5 = 0.08025$$

28. (1)

M.G.F. of a normal distribution

$$M_x(t) = e^{\mu t + \frac{t^2 \sigma^2}{2}}$$

29. (3)

$$P(X=x) = nC_x q^x q^{n-x}$$

Given

$$9P(X=4) = P(X=2)$$

$$\Rightarrow 9 \times 6C_4 p^4 q^2 = 6C_2 p^2 q^4$$

$$\Rightarrow 9 \times p^2 = q^2$$

$$\Rightarrow 9p^2 = (1-q)^2$$

$$= 1 + p^2 - 2p$$

$$\Rightarrow 8p^2 + 2p - 1 = 0$$

$$\begin{aligned} \therefore p &= \frac{-2 \pm \sqrt{4 + 32}}{2 \times 8} \\ &= \frac{-2 \pm 6}{16} \\ \therefore p &= \frac{-2 - 6}{16} \text{ or } \frac{-2 + 6}{16} \\ \Rightarrow p &= \frac{-1}{2} \text{ or } \frac{1}{4} \end{aligned}$$

Since P is positive

$$\Rightarrow p = \frac{1}{4}$$

30. (3)

If three balls are of different colours, then one will be red, one will be blue and one will

\therefore Required probability

$$\begin{aligned} &= \frac{2C_1 \times 3C_1 \times 4C_1}{9C_3} \\ &= \frac{2 \times 3 \times 4}{9 \times 8 \times 7} \\ &= 1 \times 2 \times 3 \\ &= \frac{2}{7} \end{aligned}$$

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