Find the area of the triangle determined by the vectors $3\overrightarrow{i} + 4\overrightarrow{i}$ and $-5\overrightarrow{i} + 7\overrightarrow{i}$. 30. (Ans: 41 sq. units) [Q.N. 3(b), 2064] Using vector method, prove in any triangle, that : 31. $b^2 = c^2 + a^2 - 2ca CosB$ [Q.N. 11(a), 2064] If \overrightarrow{i} , \overrightarrow{i} , \overrightarrow{k} are three mutually perpendicular unit vectors and 32. $\overrightarrow{a} = \overrightarrow{i} - 2 \overrightarrow{i} + \overrightarrow{k}$, $\overrightarrow{b} = 2 \overrightarrow{i} - 3 \overrightarrow{i} - \overrightarrow{k}$, find the cosine of the angle [Q.N. 4(a), 2063] Ans.: cos-17 33. Using vector method, prove in any triangle that: a = b CosC + c CosB [Q.N. 11(a), 2063] Find the area of the parallelogram determined by the vectors 34. $\overrightarrow{i} + 2 \overrightarrow{i} + 3 \overrightarrow{k} \text{ and } -3 \overrightarrow{i} - 2 \overrightarrow{i} + \overrightarrow{k}$ [Q.N. 3(b), 2062] (Ans.: 6\sqrt{5} sq. unit) Prove vectorically that : Cos (A-B) = CosA Cos B + SinA SinB 35. [Q.N. 11(a), 2062] Find a unit vector perpendicular to $2\overrightarrow{i} + 3\overrightarrow{i} - \overrightarrow{k}$ and $\overrightarrow{i} + \overrightarrow{i} - 2\overrightarrow{k}$. 36. $\left(Ans: \frac{-5}{\sqrt{35}} \vec{i} + \frac{3}{\sqrt{35}} \vec{j} - \frac{1}{\sqrt{35}} \vec{k}\right)$ [Q.N. 3(b), 2061] If \overrightarrow{a} and \overrightarrow{b} are two vectors of unit length and θ is the angle between them. Show 37. that $\frac{1}{2} | \overrightarrow{a} - \overrightarrow{b} | = \sin \frac{0}{2}$ [Q.N. 4(a), 2061] Prove, in any triangle, by vector method that: 38. $\frac{\text{SinA}}{\text{a}} = \frac{\text{SinB}}{\text{b}} = \frac{\text{SinC}}{\text{c}}$ [Q.N. 11(a), 2061] 39. Find the cosine of the angle between the vectors $2\overrightarrow{1} + \overrightarrow{1} + \overrightarrow{k}$ and $4\overrightarrow{1} + 3\overrightarrow{1} + 5\overrightarrow{k}$ [Q.N. 3(b), 2060] $\left(Ans: \frac{8}{5\sqrt{3}}\right)$ Prove by vector method: sin(A - B) = sin A cos B - cos A sin B. 40. [Q.N. 11(a), 2060] Find the angle between two vectors a = i + j - 2k and b = 2i - j - k. 41. (Ans: 60°) [Q.N. 4(a), 2059] Prove by vector method: Sin(A+B) = Sin A Cos B + Cos A SinB. 42. [Q.N. 11(a), 2059] 43. Show that the area of the parallelogram determined by: $\overrightarrow{i} + \overrightarrow{i} - 3\overrightarrow{k}$ and $-\overrightarrow{i} - 2\overrightarrow{i} - 3\overrightarrow{k}$ is $\sqrt{118}$ sq. units [Q.N. 3(b), 2058] Prove by vector method. 44. cos(A-B) = cosA cosB + sinA, sinB. [Q.N. 11(a), 2058] Prove by vector method 45. Cos (A - B) = CosA CosB +SinA SinB [Q.N. 11(a), 2057]

Unit 7: Derivative and its Application

7.	L Continuity	and differen	tiability

1. Show that
$$\lim_{x\to 0} \frac{\log(l+x)}{x} = 1$$
 [Q.N. 2(b), 2057]

7.2 Differential Coefficients by definition (by first principle)

- 1. Find, from first principles, the derivative of xlnx. [Q.N.11(Or), 2072'C'] (Ans: $1 + \ell nx$)
- 2. Find from first principles the derivative of $\ln \cos^{-1}x$. [Q.N.11(Or), 2072'D'] $Ans: \frac{-1}{\sqrt{1-x^2\cos^{-1}x}}$
- 3. Solve: $x \frac{dy}{dx} + y 1 = 0$. 2[Q.N.4(a), 2072'E']
- (Ans: x(y 1) = e)
 4. Find from first principles the derivative of sinx². [Q.N.11(Or), 2072'E']
 (Ans: 2x cosx²)
- 5. Find from first principle, the derivative of tan-1x. 6 [Q.N. 11(OR), Set 'C' 2071]

 (Ans: $\frac{dy}{dx} = \frac{1}{1-x}$)
- 6. Find from first principle, the derivative of: $\ln(\sin \frac{x}{a})$.
 - (Ans: $\frac{d}{dx} \left(\log \sin \frac{x}{a} \right) = \frac{1}{a} \cot \frac{x}{a}$) 6 [Q.N. 11(OR), Set 'D' 2071] Find from first principles, the derivative of log (tanx). [Q.N. 11(OR), 2070 'C']
- 7. Find from first principles, the derivative of log (tanx). [Q.N. 11(OR), 207

 Ans: 1

 Sinx.cosx
- B. Find from first principles, that derivative of x*. [Q.N. 11(OR), 2070 'D']

 (Ans: x* (1 + logx))
- 9. Find from first principles the derivative of logcos-1x. [Q.N. 11(OR), Supp. 2069]
- 10. Find from first principle, the derivative of sin(logx)

 (Ans: \frac{1}{2} \cos(logx))
- 11. Find from first principle, the derivative of e^{sinx}. [Q.N. 11(OR), Set 'B' 2069] (Ans: cosx. e^{sinx})
- 12. Find from first principle, the derivative of : e^{sinx} [Q.N. 10(b), 2068]
- (Ans: $cosx e^{sinx}$)

 13. Find from first principles, the derivative of : $sin^{-1}x$. [Q.N. 10(b), 2067] $\left(Ans: \frac{1}{\sqrt{1-x^2}}\right)$
- Find the derivative of Sin (log x) from first principles. [Q.N. 10(b), 2066]
 Ans: \(\frac{1}{r}\) cos (logx)
- Find from first principles, the derivative of a^x. [Q.N.10(b), 2065]
 (Ans: a^xloga)
- Find from first principles, the derivative of log sinx. [Q.N. 10(b), 2064]
 (Ans: cotx)

4		Mathematices 141
17.	Find from first principles, the derivative of log tanx	[Q.N. 10(b), 2063]
	(Ans.: 1 sinx.cosx)	dates
18.	Find from first principles, the derivative of tan-1x.	[Q.N. 10(b), 2062]
1008.4	$\left(Ans.:\frac{1}{1+x^2}\right)$	isvisioni brita 9.
19.	Find from first principles, the derivative of e	[Q.N. 10(b), 2061]
	$\left(Ans: \frac{1}{2\sqrt{x}}e^{\sqrt{x}}\right)$	and the state of t
20.	Find from first principles, the derivative of esinx	[Q.N. 10(b), 2060]
MENTA ((Ans: cosx.e ^{sinx})	NESS CHOTE SOUTH
21.	Find from first principles, the derivative of e ^{tanx} .	[Q.N. 10(b), 2058]
	(Ans: sec ² x e ^{tanx})	avnen edings
7.3	Derivative of hyperbolic function	3 24 A
1.	Find the derivative of: $\left(\cosh \frac{x}{a}\right)^{\log x}$	[Q.N. 2(b), 2068]
da va	Ans: $\left(\cosh \frac{x}{a}\right)^{\log x} \left(\frac{1}{a^2} \tanh \frac{x}{a} \log x + \frac{1}{x} \log \cosh \frac{x}{a}\right)$	dnie in and j ne Inggest an
2.	Find the derivative of $x^{\cosh \frac{x}{a}}$.	[Q.N. 2(b), 2067]
1105 7	F8 (e)6 M(0)	\$7.(1.0) seal
11 18 <u>1</u>	Ans: $x = \frac{\cos h_{a}^{x}}{x} + \frac{\log x \sin h_{a}^{x}}{x}$	Seuce and this is a country of the sounds of the sound of
3.	Find the derivative of 2 tanh-1 $\left(\tan \frac{1}{2}x\right)$	[Q.N. 2(b), 2066]
J. ,		[4.14. 2(0), 2000]
168 de	(Ans: secx) Find the derivative of Arc tan Sin hx.	[Q.N.2(b), 2065]
4.	작가 하다 하다 있다면 하는 사람들은 사람들은 사람들이 모르는 사람들이 모르다.	[Q.N.2(D), 2005]
	$\left(Ans: \frac{cosnx}{1 - sinh^2x}\right)$	
5	Find the derivative of : $\left(\sin h \frac{x}{a}\right)^{x^2}$	[Q.N. 2(b), 2064]
		well academ wally to
1805 (Ans: $\left(\sin\frac{x}{a}\right)^{x^2} \left[\frac{x^2}{a}\cot\frac{x}{a} + 2x\log\sinh\frac{x}{a}\right]$	STATE OF STATE
6.	Find the derivative of $x^{\cosh^2 \frac{x}{a}}$.	[Q.N. 2(b), 2063]
1908 1	S(MO) 2002X Break and the Department	is in an area of
	$\left(Ans.: x \frac{\cosh^2 \frac{x}{a}}{a} \left(\frac{1}{x} \cdot \cosh^2 \frac{x}{a} + \frac{1}{a} \cdot \log x \cdot \sin \frac{2x}{a} \right) \right)$	in the second
7.	Find the derivative of log(sinh*/a)	V 80 45 14 25
	(Ans : 1 costx)	
	Ans := coth=	

```
Find the derivative of x cos h x/a
                                                                                          (Q.N. 2(b), 2061)
                   cosh x/a + log x sinh x/a
         Find the derivative of 2 tan<sup>-1</sup> \left(\tanh \frac{x}{2}\right)
                                                                                           [Q.N. 2(b), 2060]
9.
          (Ans: Sechx)
          Find the derivative of e<sup>cosh-1</sup> x
                                                                                           [Q.N. 2(a), 2059]
10
           Ans: \frac{1}{\sqrt{x^2-1}} e^{\cosh^{-1}x}
          Find, from definition, the derivative of e<sup>tanx</sup>.
                                                                                         [Q.N. 10(b), 2059]
11.
          (Ans: sec2xetanx)
          Find the derivative of x Coshx
                                                                                           [Q.N. 2(b), 2058]
12.
           Ans: x coshx (coshx + log x sinhx)
          Find the derivative of \left(\sinh \frac{x}{a} + \cosh \frac{x}{a}\right)^{nx}
                                                                                          IQ.N. 10(b), 2057]
13.
           Ans: n \left( \sinh \frac{x}{a} + \cosh \frac{x}{a} \right)^{nx} \left[ \frac{x}{a} + \log \left( \sinh \frac{x}{a} + \cosh \frac{x}{a} \right) \right]
7.4
          Tangent and Normal
          Find the points on the circle x^2 + y^2 = 16 at which the tangents are parallel to X-axis.
1.
                                                                                       2[Q.N.3(a), 2072'E']
          (Ans: (0, 4), (0, -4))
          Find the points on the curve y = x^3 - 3x^2 + 1 where the tangent is parallel to the x-axis. 2
2.
                                                                                   [Q.N. 3(a), Set 'C' 2071]
          (Ans: (0, 1), (2, -3))
          Find the equation of the tangent to the curve y = 2x^3 - 5x^2 + 8 at (2, 4)
3.
                                                                                     2 [Q.N. 3(a), 2070 'D']
          (Ans: 4x - v - 4 = 0)
                                                                                           [Q.N. 5(c), 2068]
          At what angle does the curve y(1+x) = x cut the x-axis?
           Ans:
          Find the angle of intersection between the curves y = x^2 and
5.
                                                                                           [Q.N. 2(c), 2067]
          6y = 7 - x^3 at (1, 1).
            Ans: tan-1 ( ±
          Find the angle of intersection of the curves y^2 = x^3 and y = 2x at the point (0, 0).
6.
            Ans: tan^{-1}(\pm 2) at (0, 0) tan^{-1}(\pm \frac{1}{7}) at (4, 8)
                                                                                           IQ.N. 2(c), 2066]
          Find where the tangent is parallel to the x-axis for the curve
7.
                                                                                            [Q.N.2(c), 2065]
          y = x^3 - 3x^2 - 9x + 15.
          (Ans: (-1, 20) and (3, -12))
          Find the points on the curve y = x^3 - 3x^2 + 1 where the tangents are parallel to x-axis.
8.
                                                                                            [Q.N. 2(c), 2064]
          (Ans: (0, 1), (2, -3))
                                                                                            [Q.N. 2(c), 2062]
9.
          Find the angle of intersection of the curves
          4v = x^2 + 12 and v^2 = 8x at (2,4)
          (Ans.: 0°)
           Find the slope and inclination with the x-axis of the tangent of y = -3x - x^4 at x = -1.
 10.
            Ans: 1 and \frac{\pi}{4}
                                                                                            [Q.N. 2(c), 2061]
```

[Q.N. 3(a), Supp. 2069]2

Find the points on the curve $4y = x^4 - 8x^2$ where the tangents are paralleled to the x-11. [Q.N. 5(c), 2060] axis. (Ans: (0, 0), (-2, -4) and (2, -4) Find the slope and inclination with x -axis of the tangent of: $x^2 + y^2 = 36$ at (0.6). 12. [Q.N. 5(c), 2058] (Ans: 0 and 0°) 13. Find the slope and inclination with X -axis of the tangent of the curve $2v = 2 - x^2$ at x = 1. [Q.N. 5(c), 2057] L Hospital's rule, Roll's Theorem & Mean Value Theorem 7.5 Evaluate, using L' Hospitals rule: $x \to 0$ tanax 2[Q.N.3(a), 2072'C'] 1. Ans: a State Rolle's theorem. Verify Rolle's theorem for the functions $f(x) = 2x^3 - 3x + 1$ in 2. 1/2,1 6[Q.N.11, 2072'C'] Using L' Hospitals rule, evaluate: $\underset{x\to 0}{\text{Lt}} \frac{e^x - x - e^x}{x^2}$ 2[Q.N.3(b), 2072'D'] 3. Ans: State Mean Value theorem. Verify the mean value theorem for the function $f(x) = \sqrt{x^2 - 4}, x \in [2, 4].$ 6[Q.N.11, 2072'D'] (Ans: $c = \sqrt{6}$) State Rolle's theorem. What is the geometrical interpretation of Rolle's theorem. Verify 5. Rolle's theorem for the function $f(x) = \sqrt{1 - x^2}, x \in [-1, 1]$. 6[Q.N.11, 2072'E'] (Ans: c = 0)State mean value theorem. Interpret it geometrically. Verify the mean value theorem for 6 IQ.N. 11. Set 'C' 20711 the function f(x) = (x - 1)(x - 2)(x - 3) in [1, 4]. 7. Using L Hospital's rule, evaluate: ex+e-x - 2cosx 2 (Q.N. 3(a), Set 'D' 2071] $x \rightarrow 0$ sin2x [Ans: 1] State Rolle's theorem. Interpret it geometrically. Verify Rolle's theorem for the function $f(x) = x(x-3)^2$ for $x \in [0, 3]$. 6 [Q.N. 11, Set 'D' 2071] Using L Hospital's rule, evaluate: $\lim_{x \to 0} \frac{\tan x - x}{x - \sin x}$ 2 [Q.N. 3(a), 2070 'C'] 9. [Ans: 2] State Rolle's theorem. Interpret it geometrically. Verify Rolle's theorem for the function 10. 6 [Q.N. 11, 2070 'C'] $f(x) = x(x-3)^2$ for $x \in [0, 3]$. [Ans: C = 1] State mean value theorem. Interpret it geometrically. Verify mean value theorem for the 11. 6 [Q.N. 11, 2070 'D'] function $f(x) = x(x - 1)^2$ in [0, 2]. Ans: $c = \frac{4}{2}$ Evaluate, using L'Hospital rule $\underset{x \to 0}{\text{Lt}} \frac{e^x + e^{-x} - 2\cos x}{\sin^2 x}$

[Ans: 1]

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Using mean value theorem, find a point on the parabola $y = (x - 3)^2$ where the tangent is parallel to the chord joining the points (3, 0) and (4, 1).

$$\left(\text{Ans:} \frac{7}{2}, \frac{1}{4}\right)$$

6 [Q.N. 11, Supp. 2069]

14. Using L Hospital's rule, evaluate: $\lim_{x \to 0} \frac{e^x - x - 1}{x^2}$ [Q.N. 3(a), Set 'A' 2069]

 $\left(Ans: \frac{1}{2}\right)$

15. State mean value theorem. Interpret it geometrically. Verify mean value theorem for the function $f(x) = x^3 + x^2 - 6x$ in [-1, 4]. 6 [Q.N. 11, Set 'A' 2069]

Using L Hospital's rule, evaluate:

$$\lim_{x \to 0} \frac{x - \sin x}{x^3}$$

[Q.N. 3(a), Set 'B' 2069]

 $\left(Ans:\frac{1}{6}\right)$

17. State mean value theorem. Interpret it geometrically. Verify mean value theorem for the function f(x) = (x-1) (x-2) (x-3) in [1,4]. [Q.N. 11, Set 'B' 2069]

Unit 8: Antiderivatives

1. Evaluate: $\int \frac{dx}{1 - 2\cos x}$

2[Q.N.3(b), 2072'C']

$$\left(\text{Ans: } \frac{1}{\sqrt{3}} \log \frac{\sqrt{3} \tan \frac{x}{2} - 1}{\sqrt{3} \tan \frac{x}{2} + 1} + C\right)$$

2. Evaluate : $\int \frac{dx}{(x-2)^2 (x-3)^3}$

4[Q.N.7(a), 2072'C']

$$\left(\mathsf{Ans} : -\frac{1}{2} \left(\frac{\mathsf{x} - 2}{\mathsf{x} - 3} \right)^2 + 3 \left(\frac{\mathsf{x} - 2}{\mathsf{x} - 3} \right) - \log \frac{\mathsf{x} - 2}{\mathsf{x} - 3} - \frac{\mathsf{x} - 3}{\mathsf{x} - 2} + C \right)$$

3. Compute the integral $\int \frac{\coth x \, dx}{\sinh x - 9 \, \text{cosech}x}$

2[Q.N.3(a), 2072'D']

$$\left(\text{Ans:} \frac{1}{6} \log \frac{\sinh x - 3}{\cosh x + 3} + c\right)$$

4. Evaluate: $\int \frac{dx}{(x-1)^2 (x-2)^3}$

4[Q.N.7(a), 2072'D']

$$\left(\text{Ans:} -\frac{1}{2} \left(\frac{x-1}{x-2}\right)^2 + 3 \left(\frac{x-1}{x-2}\right) - 3 \log \left(\frac{x-1}{x-2}\right) - \frac{x-2}{x-1} + c\right)$$

5. Evaluate: $\int \frac{dx}{\sqrt{(x-\alpha)(x-\beta)}} (\beta > \alpha)$

2[Q.N.3(b), 2072'E']

(Ans: $2\log(\sqrt{x-\alpha} + \sqrt{x-\beta}) + c$)

6. Evaluate:
$$\int \frac{dx}{2 + 3\cos x}$$

4[Q.N.7(a), 2072'E']

$$\left(\text{Ans:} \frac{1}{\sqrt{5}} \frac{\log \sqrt{5} + \tan \frac{x}{2}}{\sqrt{5} - \tan \frac{x}{2}} + C\right)$$

7. Evaluate:
$$\int \frac{6x+1}{x^2+9} dx.$$

(Ans: 3 log (x² + 9) +
$$\frac{1}{3}$$
 tan-1 $\frac{x}{3}$ + C)

4 [Q.N. 7(a), Set 'C' 2071]

8. Evaluate:
$$\int \frac{dx}{1-2\cos x}$$
.

$$\left(\text{Ans:} \frac{1}{\sqrt{3}} \log \left(\frac{\sqrt{3} \tan \frac{x}{2} - 1}{\sqrt{3} \tan \frac{x}{2} + 1} \right) + C \right)$$

9. Evaluate:
$$\int \frac{dx}{\sqrt{2ax+x^2}}$$

[Ans: log (x + a + $\sqrt{x^2 + 2ax}$) + C 10. Evaluate: $\int \frac{dx}{1-3\sin x}$

4 [Q.N. 7(a), Set 'D' 2071]

Ans:
$$\left(\frac{1}{2\sqrt{2}}\log \frac{\tan \frac{x}{2} - 3 - 2\sqrt{2}}{\tan \frac{x}{2} - 3 + 2\sqrt{2}} + C\right)$$

11. Evaluate: $\int \frac{2x+3}{4x^2+1} dx.$

(Ans:
$$\frac{1}{4} \log (4x^2 + 1) + \frac{3}{2} \tan^{-1} 2x + C$$
)

12. Evaluate: $\int \frac{dx}{2 + \cos x}$

$$\left(\text{Ans:} \frac{2}{\sqrt{3}} \tan^{-1} \left(\frac{\tan^{-1} \frac{x}{2}}{\sqrt{3}}\right) + C\right)$$

13. Evaluate: $\int \frac{dx}{\sqrt{(x-\alpha)(x-\beta)}}, (\beta>\alpha)$

2 [Q.N. 3(b), 2070 'D']

(Ans:
$$2\log (\sqrt{x-\alpha} + \sqrt{x-\beta}) + C$$
)

14. Evaluate: $\int \frac{dx}{1+2\sin x}$

4 [Q.N. 7(a), 2070 'D']

$$\left(\text{Ans:} \frac{1}{\sqrt{3}} \log \frac{\tan \frac{x}{2} + 2 - \sqrt{3}}{\tan \frac{x}{2} + 2 + \sqrt{3}} + C\right)$$

15. Evaluate:
$$\int \frac{dx}{1 + \sin x + \cos x}$$
.
(Ans: $\log \left(1 + \tan \frac{x}{2}\right) + c$)

Evaluate:
$$\int \frac{x^2}{x^4 - 2x^2 - 15} dx$$

(Ans;
$$\frac{\sqrt{3}}{8} \tan^{-1} \frac{x}{3} + \frac{\sqrt{5}}{16} \log \frac{x - \sqrt{5}}{x + \sqrt{5}} + C$$
)

17. Evaluate:
$$\int \frac{dx}{\sqrt{2ax-x^2}}$$
.

Ans: $\sin^{-1} \frac{x-a}{a} + c$

18. Evaluate:
$$\int \frac{dx}{3\sin x - 4\cos x}$$

$$\left(Ans: \frac{1}{5} \frac{\tan \frac{x}{2} - \frac{1}{2}}{\tan \frac{x}{2} + 2} + c\right)$$

19. Evaluate:
$$\int \frac{dx}{e^x + e^{-x}}$$

(Ans:
$$tan^{-1} e^x + c$$
)
20. Evaluate:
$$\int \frac{dx}{2 + 3\cos x}$$

$$\left(\text{Ans: } \frac{1}{\sqrt{5}} \log \frac{\sqrt{5} + \tan \frac{x}{2}}{\sqrt{5} - \tan \frac{x}{2}} + C\right)$$

21. Evaluate:
$$\int \frac{dx}{\sqrt{2ax - x^2}}$$

$$\left(Ans: sin^{-1} \frac{x - a}{a} + C\right)$$

22. Evaluate:
$$\int \frac{dx}{1 + \sin x + \cos x}$$
$$\left(Ans: \log\left(1 + \tan\frac{x}{2}\right) + C\right)$$

23. Evaluate:
$$\int \frac{1}{x^2} e^{-\frac{1}{x}} dx$$

(Ans:
$$e^{-\frac{1}{x}} + C$$
)
24. Evaluate: $\int \frac{dx}{1 + 2 \sin x}$

$$\left(\text{Ans:} \frac{1}{\sqrt{3}} \log \frac{\tan \frac{x}{2} + 2 - \sqrt{3}}{\tan \frac{x}{2} + 2 + \sqrt{3}} + C\right)$$

25. Integrate:
$$\int \frac{dx}{\sqrt{2ax + x^2}}$$

[Q.N. 3(a), 2066]

(Ans:
$$log(x + a) + \sqrt{x^2 + 2ax} + c$$
)

Integrate: $\int \frac{x^2}{(x+2)(x+3)^2} dx$ 26.

[Q.N. 11(b), 2066]

(Ans:
$$4\log(x+2) - 3\log(x+3) + \frac{9}{x+3} + c$$
)

[Q.N.3(a), 2065]

7. Evaluate:
$$\int \frac{dx}{e^x + e^{-x}}$$
$$(Ans: tan^{-1}(e^x) + c)$$

28. Integrate:
$$\int \frac{dx}{3+4 \cos hx}$$

[Q.N.11(b), 2065]

$$\left(\text{Ans:} \frac{2}{\sqrt{7}} \tan^{-1} \left(\frac{\tan h \frac{x}{2}}{\sqrt{7}}\right) + c\right)$$

Evaluate: $\int \frac{dx}{x^2 - 16}$

[Q.N. 3(a), 2064]

$$\left(Ans: \frac{1}{8} \log \frac{x-4}{x+4} + C\right)$$

30.

Integrate: $\int \frac{\cos x - \sin x}{\sqrt{\sin 2x}} dx$

[Q.N. 11(b), 2064]

$$\left(\text{Ans: log }\left\{\left(\sin x + \cos x\right) + \sqrt{\sin 2x}\right\} + c\right)$$

31. Integrate: $\int \frac{dx}{1+\sin x + \cos x}$

[Q.N. 11(b), 2063]

$$\left(Ans.: log\left(1 + tan\frac{x}{2}\right) + C\right)$$

32. Integrate:
$$\int \frac{dx}{\sqrt{2ax-x^2}}$$

[Q.N. 3(a), 2062]

$$\left(Ans.: Sin^{-1} \frac{x-a}{a} + C\right)$$

[Q.N. 11(b), 2062]

$$\left(\operatorname{Ans.:} \frac{1}{\sqrt{2}} \log \left[\tan \left(\frac{x}{2} + \frac{\pi}{8} \right) \right] + C \right)$$

33.

Evaluate: $\int \sqrt{\frac{1+x}{1-x}} dx$

[Q.N. 3(a), 2061]

$$(Ans: -\sqrt{1-x^2} + sin^{-1}x + c)$$

35. Find the value of :
$$\int \frac{dx}{3 \sin x - 4 \cos x}$$

[Q.N. 11(b), 2061]

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and Logic 12 - Short - 12 - Short and

$$\left(Ans: \frac{1}{5} log \frac{Tan \frac{x}{2} - \frac{1}{2}}{Tan \frac{x}{2} + 2} + C\right)$$

36. Evaluate :
$$\int \frac{dx}{\sqrt{a^2 - x^2}}$$

[Q.N. 3(a), 2060]

$$\left(Ans: \sin^{-1}\frac{X}{a} + C\right)$$

Find the value of :

$$\int \frac{\sin x \cdot \cos x}{(\sin x + \cos x)^2} dx$$

[Q.N. 11(b), 2060]

$$\left(Ans: -\frac{1}{2} \frac{1}{(Tanx+1)} + C\right)$$

38.
$$\int \frac{dx}{a + b \cos x} \ a < b.$$

[Q.N. 11(b), 2059]

Ans:
$$\frac{1}{\sqrt{b^2 - a^2}} \log \left(\frac{\sqrt{b+a} + \sqrt{b-a} \tan \frac{x}{2}}{\sqrt{b+a} - \sqrt{b-a} \tan \frac{x}{2}} \right) + C$$

39. Prove that:
$$\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1} \frac{x}{a} + c.$$

[Q.N. 3(a), 2058]

40. Integrate:
$$\int \sqrt{\frac{1+x}{1-x}} dx.$$

41.

[Q.N. 11(b), 2058]

$$(Ans: -\sqrt{1-x^2} + sin^{-1}x + c)$$

[Q.N. 3(a), 2057]

41. Prove:
$$\int \operatorname{Cosecx} dx = \log \left| \tan \frac{x}{2} \right| + c$$

42. Integrate: $\int \frac{dx}{a + b \cos x}$ when $a > b$.

[Q.N. 11(b), 2057]

$$\left(Ans: \frac{2}{\sqrt{a^2 - b^2}} Tan^{-1} \left(\sqrt{\frac{a - b}{a + b}} tan \frac{x}{2} \right) + C \right)$$

Unit 9: Differential Equations and their Applications

1. Solve:
$$\frac{dy}{dx} + \frac{y}{x} = 1$$
.
(Ans: $xy = \frac{x^2}{2} + C$)

2[Q.N.4(a), 2072'C']

har bear (The ma)

[Q.N. 7(b), 2070 'C']

2. Solve:
$$\frac{dy}{dx} = y \tan x - 2 \sin x$$

$$(Ans: y \cos x = \frac{\cos 2x}{2} + C)$$
3. Solve: $xy \frac{dy}{dx} - y^2 = x^2$

$$(Ans: y^2 = 2x^2 (\log x + C))$$
4. Solve: $\frac{dy}{dx} + \frac{1 + \cos 2y}{1 + \cos 2y} = 0$

$$(Ans: \tan y - y + x = c)$$
5. Reduce the equation $\frac{dy}{dx} + \frac{y}{x} = y^2$ in liner form hence solve it.
$$(Ans: \frac{1}{xy} = -\log x + c)$$
6. Solve: $\frac{dy}{dx} = \frac{y+1}{x+y+1}$

$$(Ans: y + 1 = ce^{y+1})$$
7. Solve: $\frac{dy}{dx} = \frac{y+1}{x+y+1}$

$$(Ans: \cot (\frac{y}{x}) = \log x + c)$$
8. Solve: $\sin x \frac{dy}{dx} + \cos x y = x \sin x$

$$(Ans: y \sin x = -x \cos x + \sin x + c)$$
9. Solve: $e^{xy} - dx + e^{y-x} dy = 0$

$$(Ans: e^{2x} + e^{3x} = C)$$
10. Solve: $e^{xy} - dx + e^{y-x} dy = 0$

$$(Ans: y \sin x + \frac{1}{4} \cos 2x = c)$$
11. Solve: $\sin x \frac{dy}{dx} + (\cos x), y = \sin x.\cos x$

$$(Ans: y \sin x + \frac{1}{4} \cos 2x = c)$$
12. Solve: $\frac{dy}{dx} + \frac{2}{1+x^2}$

$$(Ans: y = e^{2x} - 2x^2 + C)$$
13. Solve: $xy = \frac{dy}{dx} + \frac{1}{(1+x^2)^2}$

$$(Ans: y^2 = 2x^2 (\log x + C)$$
14. Solve: $\frac{dy}{dx} + \frac{2}{1+x^2} \cdot y = \frac{1}{(1+x^2)^2}$

$$(Ans: y^2 = 2x^2 + 2x + C)$$
15. Solve: $\frac{dy}{dx} = \frac{e^{x} + 1}{y}$

$$(Ans: y^2 = 2x^2 + 2x + C)$$
16. Solve: $\frac{dy}{dx} = \frac{e^{x} + 1}{(1+x^2)^2}$

$$(Ans: y = 2x^2 (\log x + C)$$
17. Solve: $\frac{dy}{dx} + \frac{1}{(1+x^2)^2} \cdot \frac{1$

16.

[Ans: y = 1 + Ce-tan x]

17. Solve:
$$\frac{dy}{dx} = \frac{y}{x} - Sin^2\frac{y}{x}$$
. [Q.N. 7(b)(QR), 2070 'C']

(Ans: Cot $\frac{y}{x} = \log x + C$)

18. Solve: $x^2 dy - y^2 dx = 0$
(Ans: $y - x = Axy$)

19. Solve: $(1 + x^2) \frac{dy}{dx} + 2xy = 4x^2$.

4 [Q.N. 7(b), 2070 'D']

(Ans: $(1 + x^2) y = \frac{4}{3}x^2 + C$)

20. Solve: $(x^2 + y^2) dy = xy dx$
(Ans: $x^2 + y^2 + y = y dx$
(Ans: $y - x = C(1 + xy)$]

21. Solve: $\frac{dy}{dx} = \frac{1 + y^2}{1 + x^2}$.

[Q.N. 7(b)(QR), 2070 'D']

22. Solve: $\frac{dy}{dx} = \frac{1 + y^2}{1 + x^2}$.

2 [Q.N. 4(a), Supp. 2069]

23. Solve: $\frac{dy}{dx} = \frac{y - x + 1}{y - x + 5}$
[Q.N. 7(b)(QR), Supp. 2069]

24. Solve: $\frac{dy}{dx} = \frac{y - x + 1}{y - x + 5}$
[Q.N. 7(b)(QR), Supp. 2069]

25. Solve: $\frac{dy}{dx} = \frac{y - x + 3}{x^2 + y^2}$
[Q.N. 4(a), Set 'A' 2069]

26. Solve: $\frac{dy}{dx} = \frac{x^2 + y^2}{x^2 + y^2}$
[Q.N. 4(a), Set 'A' 2069]

27. Solve: $\frac{dy}{dx} = \frac{x^2 + y^2}{x^2 + y^2}$
[Q.N. 7(b)(QR), Set 'A' 2069]

28. Solve: $\frac{dy}{dx} = \frac{x^2 + y^2}{x^2 + y^2}$
[Q.N. 7(b)(QR), Set 'B' 2069]

(Ans: $\frac{dy}{dx} = \frac{x^2 + y^2}{x^2 + y^2}$
[Q.N. 7(b), Set 'B' 2069]

(Ans: $\frac{dy}{dx} = \frac{x^2 + y^2}{x^2 + y^2}$
[Q.N. 7(b), Set 'B' 2069]

(Ans: $\frac{dy}{dx} = \frac{x^2 + x^2}{x^2 + y^2}$
[Q.N. 7(b), Set 'B' 2069]

(Ans: $\frac{dy}{dx} = \frac{x^2 + x^2}{x^2 + y^2}$
[Q.N. 7(b)(QR), Set 'B' 2069]

(Ans: $\frac{dy}{dx} = \frac{x^2 + x^2}{x^2 + y^2}$
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(Ans: $\frac{dy}{dx} = \frac{x^2 + x^2}{x^2 + y^2}$
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(Ans: $\frac{dy}{dx} = \frac{x^2 + x^2}{x^2 + y^2}$
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(Ans: $\frac{dy}{dx} = \frac{x^2 + x^2}{x^2 + y^2}$
[Q.N. 7(b)(QR), Set 'B' 2069]

(Ans: $\frac{dy}{dx} = \frac{x^2 + x^2}{x^2 + y^2}$
[Q.N. 7(b)(QR), Set 'B' 2069]

(Ans: $\frac{dy}{dx} = \frac{x^2 + x^2}{x^2 + y^2}$
[Q.N. 6(c), 2068]

(Ans: $\frac{dy}{dx} = \frac{x^2 + x^2}{x^2 + y^2}$
[Q.N. 6(c), 2068]

32.

 $(Ans: 2xy + x^2 = c^2)$

```
Solve: (1 - x^2) \frac{dy}{dx} = 1 + xy
                                                                                    [Q.N. 11(b) (Or)), 2067]
33.
          (Ans: \sqrt{1-x^2} \ y = sin^{-1} \ x + C)
          Solve the differential equation (x + 2y - 3) dy - (2x - y + 1) dx = 0. [Q.N. 6(c), 2066]
34.
          (Ans: xy + y^2 - x^2 - 3y - x = c)
          Solve the differential equation: (1 + x^2) \frac{dy}{dx} + y = e^{\tan x}
                                                                                       [Q.N. 11(b)Or, 2066]
35.
           Ans: y = 2 eum + ce-um 1
                                                                                             [Q.N.6(c), 2065]
          Solve: (xy^2 + x) dx + (yx^2 + y) dy = 0.
36.
          (Ans: 2x^3 + 2y^3 + 3x^2y^2 = c)
          Solve: \frac{dy}{dx} + y \cot x = x.
                                                                                       [Q.N.11(b, or), 2065]
37.
          (Ans: y \sin x = -x \cos x + \sin x + c)
                                                                                            (Q.N. 6(c), 2064]
          Solve: xdy + (x + y) dx = 0
38.
          (Ans: y = x \log(cx))
                                                                                       [Q.N. 11(b)Or, 2064]
39.
          (Ans: (y - x)^2 = cxy^2)
          Solve: e^{x-y} dx + e^{y-x} dy = 0
                                                                                            [Q.N. 6(c), 2063]
40.
          (Ans.: e^{2x} + e^{2y} = C)
          Solve: \frac{dy}{dx} = \frac{y}{x} + \tan \frac{y}{x}
                                                                                       [Q.N. 11(b) Or, 2063]
41.
           \left(Ans.: \sin \frac{y}{x} = cx\right)
                                                                                            [Q.N. 6(c), 2062]
42.
          Solve: x^2dy - y^2dx = 0
          (Ans.: y - x = Axy)
                                                                                       [Q.N. 11(b)Or, 2062]
43.
           \left(Ans.: xy = \frac{X^2}{4} + C\right)
           Solve: x^2 dy - y^2 dx = 0
                                                                                            [Q.N. 6(c), 2061]
44.
          (Ans: y - x = Axy)
          Solve: (x^2 - y^2) \frac{dy}{dy} = xy
                                                                                        [Q.N. 11(b)Or, 2061]
45.
           (Ans: 2y^2 \log yC + x^2 = 0)
           Solve: \sqrt{1-x^2} \, dy + \sqrt{1-y^2} \, dx = 0
                                                                                            [Q.N. 6(c), 2060]
 46.
           (Ans: y = tan^{-1} x + C)
           Solve: tanx \frac{dy}{dx} + y = sec x
                                                                                       [Q.N. 11(b)Or, 2060]
 47.
           (Ans: ysinx = x + C)
           Solve: x dy - y dx = 0.
                                                                                            [Q.N. 2(b), 2059]
 48.
           (Ans: y = cx)
 49.
                                                                                    [Q.N. 11(b) Or, 2059]
```

 $(Ans: y^2 + x^2 = cx)$

50. Solve:
$$\frac{dy}{dx} = \frac{x^3 + 1}{y^3 + 1}$$
 [Q.N. 6(c), 2058]
$$\left(Ans: \frac{y^4}{4} + y = \frac{x^4}{4} + x + c\right)$$

51. Solve:
$$\cos^2 x \frac{dy}{dx} + y = 1$$
. [Q.N. 11(b)Or, 2058]
(Ans: $y = 1 + ce^{-tanx}$)

52. Solve:
$$\frac{dy}{dx} = \frac{x^2 + x + 1}{y^2 + y + 1}$$
 [Q.N. 6(c), 2057]

Ans:
$$\frac{y^3}{3} + \frac{y^2}{2} + y = \frac{x^3}{3} + \frac{x^2}{2} + x + A$$

53. Solve:
$$\tan x \frac{dy}{dx} + y = \sec x$$
.

[Q.N. 11(b)Or, 2057]

(Ans: ysinx = x + c)

Unit 10: Dispersion, Correlation and Regression

10.1 Measures of dispersions

1. The information about the daily temperature of two cities X and y are as follows:

Average temp. (°F) 84 92
Variance of temp. 16 25

Determine which city has greater consistency in climate. 2[Q.N.4(b), 2072'C']

(Ans: City X)

In the distribution of data 20, 25, 30, 36, 32, 43; find standard deviation.

(Ans: 7.39) 2[Q.N.4(b), 2072'D']

3. For a group of 50 items; circle $\Sigma x^2 = 600$, $\Sigma x = 150$ and $m_0 = 1.75$, find the Pearsonian coefficient of skewness. 2[Q.N.4(b), 2072'E']

(Ans: 0.72)

 Calculate the coefficient of Skewness based on mean, mode and standard deviation from the following data:
 Q.N. 8(a), Set 'C' 2071]

	from the following da	ita:				10.00	4 [Q.N. 8(a), Set 'C' 2
1	Wages (in Rs.)	100	110	120	130	140	Literal Control
	No. of persons	2	6	10	8	4	

(Ans: 0.18)

5. If n = 10, $\Sigma x = 120$, $\Sigma x^2 = 1530$, find the standard deviation and the coefficients of variation. 2 [Q.N. 4(b), Set 'D' 2071]

[Ans: r = 3, C.V. = 25%]

6. If $\Sigma fx = 110$, $\Sigma fx^2 = 1650$, N = 10 and M₀ = 12.45 find the skewness based on mean, mode and standard deviation. 4[Q.N. 8(a), 2070 'C']

[Ans: -0.22]

Consider the following distribution.

75 FA	Distribution A	Distribution B
Arithmetic mean:	100	90
Median:	90	80
Standard deviation:	10	10

Is the distribution A same as the distribution B regarding the degree of variation and skewness?

4(Q.N. 8(a), 2070 'D']

(Ans: Yes, same)

	perature (F			34	June 1100	92
Variance of T Determine whi				6 in clima	ato mission	of shit rebierro
[Ans: A]	Frontian	greater con	Sistericy	THE CHITTE		[Q.N. 4(b), Supp
	standard	deviation a	nd the	coefficie	nt of varia	ation from the f
distribution.	08		08	000111010		Q.N. 8(a), Set 'A
Profit (in Rs.)	0-10	10-20	20-30	30-40	40-50	Standard devi
No. of shops		13	16	8	5	is the distributio
(Ans: Rs. 11.						(Ans.: Same)
			d Mo = 1	12.45. fir	nd the ske	ewness based or
mode and stan	dard devia	tion.				Q.N. 8(a), Set 'E
(Ans: - 0.22)					1	(4118 1.40)
Weights of a g	roup of indi	viduals are	given b	elow. Fir	nd out the	mean and the s
deviation.		nichta zi	-	211		[Q.N. 12(a)
Weight (in kg.	0-10	10-20	20-3	0 30-	40 40-	
Frquency	12	33	. 30	15	10	Marks of A.
(Ans: 27, 11.4		Ed Ed	Va I	K) C1	581	Marks of b
Consider the fo	ollowing dis	tribution:			410	Who is intellige
distribution A		distribution				(Ans.: 8)
Arithmetic mea	n 🦠	100	agili to da		,	Find the meage
(Medium)		90			72	6 8, 10, 13 a
Standard devia		10				(Ans; 2.72) 01
skewness?	on a same					degree of variat
(Ans: Yes, sa	25-30	0 20-25	101	10-15	5-10	[Q.N. 12(b)
		n of a not	of date	CV	F0/>	= 2 and Karl P
coefficient of sk	owneed - I	of a sec	moan o	f the dat	= 5%, 0 =	= 2 and Kan P [Q.N. 4(b)
(Ans: 40)						(a)e.vi.alpian. (espectively 17
	d deviation.	Also prove	that th	e root m	nean soula	re deviation is n
than the standa	rd deviation	December of	LIA I	0 1001 11	iouii oqua	[Q.N. 12(b)
Find the standa	rd deviation	n from the fo	llowing	data:	14KGBE V90	
x: 10 11	12 13					(Ans. 1.57) Find the mean.
f: 3 12	18 12	2	nanwania nakania	00-01 00-01	III.C.,C. CALL	TIBERT BILL DITT
(Ans: 0.967)			and a	UN-U1		[Q.N. 4(b),
Calculate the coe	fficient of ske	wness from t	he follow	ing freque	ency distribi	ution: [Q.N.12(b)
Investment	10-20 2	0-30 30-		40-50	50-60	60-70 70-8
	12	18 2	0 111 110	15	10	3 2
(Ans: 0.227)	Galles Galles Andrew	instruction	(be wee	ne bone in	nitrianu iz	THIUM TO ASST
Calculate Karl F					e data:	[Q.N.12(a),
Marks	above 0	above 10		ove 20	above 3	
Frequency	150	140	3117	100	80	80
(Ans: 0.89)		Smith fil		Bliff 151 (W	SHEDAGIN DA	SCHOOL STATE OF THE STATE OF TH
	about the v	wages distril	oution o	f the firm	ns A and B	are given below
The information				Firm A		Firm B
				FAA	and nearing	
No. of workers		HERRICH STA		500	HUI STRUKSEN	600
No. of workers Average month Variable of way	nly wages			Rs. 586		600 Rs. 575

	For a group of 1		Σx =	452,	Σx^2	= 24,2							
	coefficient of ske	wness.		53				F1 01	JH, 19	iron.	[Q.N.	12(a), 2	2064]
11	(Ans: 0.076)		ou wo	. 87							8,8160	26.5	
0.	Consider the follo	owing di				3/105		J 281		CHIW		tau .	
1105	qquê (d)£ 450) s		<u>L</u>	Distrib				stribut			14.0		
DWC!	Arithmetic mean	niy e :					10				dnim:	1)5(1	
300	Median:	h			0			80				20	
	Standard devia		40		0		50	10		3/1	0		
	Is the distribution	i A Same	as i	ne dis	inbut	ion B	regar	uing ti	ne sk	ewne		A/b\ 1	2002
1	(Ans.: Same) Find the standard	d doviati	on of	the fe	llowin	na da	to .	2515	26 3	B.T.N.	[Q.N	. 4(b), 2	2003
18507	10, 15, 20, 25, 30			uie it	JIIOWII	iy ua	ia.		= 44		IO N	. 4(b), 2	2062
2009	(Ans.: 10)	0, 00, 40	,					15/12	ins	Signe	I G.II	٠, ١,٠١٠), ١	2002
2.	Following are th	e marks	ohta	ined	hy tw	o stu	dente	Δ an	d R ir	10 1	pete c	f 100 r	narks
shas	each.		ODIO	illica	Sec.	0 3.0	derito	A all	U HA	' '' ''	COLO C	1,001	naine
19UA.	Test:	1	2	3	4	5	6	7	8	9	10	Ven.	
	Marks of A:	44	80	76	48	52	72	68	56	60	54	22	
D4 14	Marks of B:	48	75	54	60	63	69	72	51	57	66		
	Who is intelligen		170	104	100	100			1			12(a),	20621
	(Ans.: B)			×		TO South Nation		Heie (113H, 515 A. I	[G.IV.	12(0),	2002
3.	Find the mean d	evietion	from	mean	of the	e follo	wina	data ·		73 a.m.	OUR IN	A B	
٥.	6, 8, 10, 13 and		HOIII	moun	OI UI	o ione	, wing	uuiu .				. 4(b),	2061
	(Ans: 2.72)	٠.				- 0			20	-Up	h biati		-001
4	Find out the mea	n and 9	tond	ard De	wintin		200						
					vialle	וסחד חו	m the	toliow	ina d	ata:			
							m the 20-2		ing a 25-30				
	Variable:	5-10 2		0-15 9	15-	20			25-30		30-35 5	100	
20,63	Variable: Frequency:	5-10 2	1	0-15	15-	20	20-2	5 1	25-30 11	sen	30-35 5	20年(新 2014年)	2061
20 63 30 63	Variable: Frequency: (Ans: 23.95 and	5-10 2 1 4.87)	- 1	0-15 9	15-	20	20-2	5 :	25-30 11	secv Sacv	30-35 5 [Q.N.	12(a),	
20 63 30 63	Variable: Frequency: (Ans: 23.95 and The median, m	5-10 2 1 4.87) node ar	1 and co	0-15 9 oeffici	15- 29 ent c	20 9 of sk	20-29 54 ewnes	5 s fo	25-30 11 11 12 12	nez certai	30-35 5 [Q.N. n dis	12(a), i	n are
2063 206. 7	Variable: Frequency: (Ans: 23.95 and The median, m respectively 17.4	5-10 2 1 4.87) node ar 1, 15.3 a	nd cond 0.	0-15 9 oeffici 35. Ca	15- 25 ent d	20 of sk	20-29 54 ewnes	ss fo	25-30 11 11 11 12 12 13 14 14 14 14 14 14 14 14 14 14 14 14 14	nez vertai	30-35 5 [Q.N. n dis [Q.N.	12(a),	n are
2063 206. 7 206. 7	Variable: Frequency: (Ans: 23.95 and The median, m respectively 17.4 (Ans: 18.45 and	5-10 2 (4.87) node ai 1, 15.3 a 1, 48.78%	1 and count of the	0-15 9 oeffici 35. Ca	15- 29 ent d alcula	20 of sk te me	54 ewnes	ss fo	25-30 11 11 12 12 13 14 14 14 14 14 14 14 14 14 14 14 14 14	nes vons certai	30-35 5 [Q.N. n dis [Q.N.	12(a), i	n are
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206.2 206. 5 206.4 206.6	Variable: Frequency: (Ans: 23.95 and The median, mespectively 17.4 (Ans: 18.45 and Find the mean di (Ans: 1.57)	5-10 2 14.87) node at 1, 15.3 a 148.78% eviation	nd cond 0.	0-15 9 oeffici 35. Ca	15- 29 ent co alcula an of t	20 of sk te me	20-25 54 ewnes ean an	ss food C.V	25-30 11 r a r.	nes vons certai	30-35 5 [Q.N. n dis [Q.N. d 6.	12(a), i	n are 2061]
206.2 206. 5 206.4 206.6	Variable: Frequency: (Ans: 23.95 and The median, mespectively 17.4 (Ans: 18.45 and Find the mean di (Ans: 1.57) Find the mean and	5-10 2 14.87) node at 1, 15.3 a 148.78% eviation	nd cond 0.	0-15 9 oeffici 35. Ca media	15- 29 ent co alcula an of the	20 of sk te me the nu	20-25 54 ewnes ean an	ss food C.V	25-30 11 r a '. ',10,	certai	30-35 [Q.N. in dis [Q.N. d 6. [Q.N	12(a), 2 tributior 12(b), 2	n are 2061
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10.2 Correlation

 Define correlation. Find Karl Pearson's coefficient of correlation of the marks of the following distribution.

TOHOWING CIST	HDUUOH.	-7 7-9	TANK MINER OF		4[4.14.0(8), 20
X	20	30	40	50	60
Υ	U 5050 5	46	30 210	24	8110318
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(Ans: - 0.937)

2. If n = 15, σ_X = 3.2, σ_Y = 3.4 and $\Sigma(X - \overline{X})$ (Y - \overline{Y}) = 122, find the correlation coefficient between the two variables. (Ans. 0.75)

Calculate Karl Pearson's correlation coefficient between the two variables height (in cms) and weight (in kg) from the data gives below:
 4 [Q.N. 8(a), Set 'D' 2071]

Height 160 162 165 161 163 Weight 63 62 64 60 61

4. If $\Sigma (X - \overline{X})^2 = 40$, $\Sigma (Y - \overline{Y})^2 = 63$ and $\Sigma (X - \overline{X})(Y - \overline{Y}) = 35$, find the correlation coefficient between the two variables. 2 [Q.N. 4(b), 2070 'C']

5. If n = 10, $\Sigma X = 60$, $\Sigma Y = 60$, $\Sigma X^2 = 400$, $\Sigma Y^2 = 580$ and $\Sigma XY = 415$, find the correlation coefficient between the two variables. (Ans. 0.59)

6. Find Karl Pearsons' coefficient of correlation of the marks of the following two group of students 4 [Q.N. 8(a), Supp. 2069]

IAns: -0.9371

X	20	30	40	50	60
Υ	50	46	30	24	8

7. Calculate the correlation coefficient between two variables from the following data: $\Sigma x^2 = 114$, $\Sigma y^2 = 422$, and $\Sigma xy = 174$ [Q.N. 4(b), 2068]

[Ans: 0.793]

8. If the covariance between the variable x and y is 18 and the variances of x and y are 16 and 81 respectively, find the coefficient of correlation between them.

(Ans: 05)

[Q.N.4(b), 2065]

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 From the following table, calculate the coefficient of correlation by Karl Pearson's method. [Q.N. 12(b), 2063]

 $\overset{X}{\overset{Y}{\overset{}{}}}$ to see § $\overset{6}{\overset{}{\overset{}{\overset{}{}}}}$ to see § $\overset{6}{\overset{}{\overset{}{\overset{}{\overset{}}{\overset{}}{\overset{}}}}}}$ to see § $\overset{6}{\overset{}{\overset{}{\overset{}{\overset{}}{\overset{}}{\overset{}}}}}}$ to see § $\overset{6}{\overset{}{\overset{}{\overset{}}{\overset{}}}}$ to $\overset{6}{\overset{}{\overset{}{\overset{}}{\overset{}}}}$

Arithmetic means of X and Y series are 6 and 8 respectively.

(Ans.: - 0.92)

Prove that the correlation coefficient between two variables lies between -1 and +1.
 [Q.N. 12(b), 2062]

11. Calculate Karl Pearson's coefficient of correlation from the following data:

x:	12	9	8	10	11	13	7
V:	14	8	6	9	11	12	3

(Ans: 0.95)

Prove that the coefficient of correlation lies between-1 and 1. [Q.N. 12(b), 2058]

13. Calculate r_{xy} if $\Sigma x^2 = 114$; $\Sigma y^2 = 442$; $\Sigma xy = 174$. [Q.N. 4(b), 2057] (Ans: 0.793)

10.3 Regression

- 1. Define regression and lines of regression. Find the correlation coefficients between the two variables when $b_{xy} = 1.8$ and $b_{yx} = 0.35$.

 (Ans: 0.79)
- The regression coefficients of x on y and y on x are 0.84 and 0.32 respectively. If the
 arithmetic means of x and y series are 42 and 26 respectively, find two equations of
 lines of regression.

natisis (Ans: y = 0.32x + 12.56, x + 0.84y + 20.16) \$ 4.8 = 10 .5.8 = 10 .51 =

3, 705 Find the regression equation of y on x when deliver owe of heavised meloilled

 $\Sigma x = 15$, $\Sigma y = 25$, $\Sigma x^2 = 55$, $\Sigma y^2 = 140$, $\Sigma xy = 78$, n = 5.

[Q.N. 4(b), Set 'A' 2069]

10.2 Correlation

4. The regression coefficient of y on x is 0.32. If the arithmetic means of x and y series are 42 and 36 respectively, find the regression equation of y on x.

(Ans: 0.32x - y - 6 = 0)

[Q.N. 4(b), Set 'B' 2069]

Ams: 0.5971

Unit 11: Probability

M = 10, $\Sigma X = 60$, $\Sigma Y = 60$, $\Sigma X^2 = 400$, $\Sigma Y^2 = 51$

11.1 Probability

1. In rolling a pair of dice, determine the probability of obtaining a sum of 10.

 $\left(\text{Ans:} \frac{1}{12}\right)$

if to othern ent positisienos to impiratesio 'enerce2[Q.N.4(c), 2072'C']

2. In a draw of a card from well shuffled deck of 52 cards what is the probability that it is a king or a queen? 2[Q.N.4(c), 2072'D']

 $\left(\text{Ans:} \frac{2}{13}\right)$

3. Two dice are rolled once. What is the probability of getting a total of 8 or 7?

(Ans: \frac{11}{36})

2[Q.N.4(c), 2072'E']

4. The chance that A can solve the problem is $\frac{3}{5}$ and the chance that B can solve the problem is $\frac{2}{3}$. Find the probability that the problem is solved. 2[Q.N. 4(c), Set 'C' 2071]

Ans: 13

20531

 Two coins are tossed simultaneously. Find the sample space. Find the probability that both are heads.
 2 [Q.N. 4(c), Set 'D' 2071]

[Ans: S ={HH, HT, TH, TT}, P(HH) = $\frac{1}{4}$]

6. A class consists of 60 boys and 40 girls. If two students are chosen at random, what is the probability that one is boy and one girl? 2 [Q.N. 4(c), 2070 'C']

 $\left(\text{Ans:} \frac{16}{33}\right)$

7. A card is drawn from a well-shuffled back of 52 cards. What is the probability that it is a king or a Diamond? 2 [Q.N. 4(c), 2070 'D']

 $\left(\text{Ans:} \frac{4}{13}\right)$

/Ans: 0.7931

- 8. Two dice are rolled simultaneously. What is the probability of turning the same digit in both dice? 2 [Q.N. 4(c), Supp. 2069] Find the man a matche mobile movel be solved if ney both to $\left(\frac{1}{6}\right)$: snA
- From 20 tickets marked from 1 to 20, one is drawn at random. Find the probability that (Q.N. 4(c), Set 'A' 20691 If P(A) and P(B) be the probabilities of the independent events A $(\frac{S}{2}; R_0K^2)$ beclively

- 10. A bag contains 5 red and 6 white balls. Two balls are drown at random. Find the probability that (i) both are red (ii) both are of the same colour. [Q.N.8(b), Set 'B' 2069] What is the probability that an English alphabet scheduced $\frac{5}{11}$
- 11. A card is drawn at random from a well-shuffled deck of 52 cards. What is the [Q.N. 4(c), 2068] probability that is a red 8, a red 9 or a red 10? Ans: $\frac{3}{26}$ State and prove "The Theorem of Total Probabi
- 12. The chance that A can solve a certain problem is 3. The chance that B can solve it. is $\frac{2}{3}$, find the chance that the problem will be solved if they both try. [Q.N.8(b),2068] None of them are defective." $\left(Ans:\frac{3}{4}\right)$
- 13. Define mutually exclusive events and dependent cases with example while performing [7602.(2)4.4(c), 4(c) Theorem of Compand Probability". an experiment.
- 14. A class consists of 40 boys and 60 girls. If two students are chosen at random, what will be the probability that (a) both are boys (b) both are girls (c) one boy and one FO.N. 8ta \$0r. 20811 ha eng bra and Q.N. 8(a), 2067]

Ans: (a) $\frac{\omega C_2}{100C_2}$, (b) $\frac{\omega C_2}{100C_2}$, (c) $\frac{\omega C_1}{100C_2}$

- The chance that A can solve a problem is $\frac{1}{4}$, the chance that B can solve it is $\frac{2}{3}$. Find 15. the probability that the problem will be solved if both of them try. [Q.N. 4(c), 2066] Ans:
- Five men in a group of 20 are graduates. If three men are chosen out of 20 at random, what is the probability of at least one being graduates? [Q.N. 8(a)Or, 2066]
- $\left(Ans: \frac{137}{22} \right)$ 17. Given P(A) = 0.4, $P(A \cup B) = 0.56$, P(B) = 0.3. Are A & B independent? . If the store is sviguence visualized visualized solutions of [Q.N.4(c), 2065] (Ans: not independent)
- 18.2 State and prove the theorem of compound probability (Q.N.8(a), 2065] 19. A bag contains 9 red, 7 white and 4 black balls. A ball is drawn at random. Find the probability of drawing (i) a white ball (ii) not a black ball. [Q.N. 4(c), 2064]
- and B are two independent events with 20. If P(A) and P(B) are the probabilities of the happening of the events A and B respectively, prove that : $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ where P(AOB) and P(AOB) have the usual meanings. What will be the form of the [Q.N. 8(a), 2064] above formula if A and B are independent events?

21. The chance that A can solve a certain problem is $\frac{1}{4}$ and the chance that B can solve it is $\frac{2}{3}$. Find the chance that the problem will be solved if they both try. Forcest mate of from 1 to 20, one is drawn at random. Fin (\$20 pm) fauly that the st 4 pm (\$10 pm) fauly that [Q.N. 4(c), 2063] If P(A) and P(B) be the probabilities of the independent events A and B respectively, 22 prove that: P(AOB) = P(A). P(B) AT siled silved best bent a strained port A Where P(AOB) has the usual meaning. [Q.N. 8(a), 2063] What is the probability that an English alphabet selected at random is (i) a vowel (ii) a 23. consonant ?sa to look betturia-liew a most musines to nwe to at [Q.N. 4(c), 2062] (Ans.: (i) $\frac{2}{7}$ (ii) $\frac{5}{7}$ vobrando inat la area 8, a lau 9 or a red 10? State and prove "The Theorem of Total Probability". (Q.N. 8(a), 20621 24 A lot contains 10 items of which 3 are defective. Three items are chosen from the lot at 25. random one after another without replacement. Find the probability that: (i) All three are defective. meldone and to a sonarto and on None of them are defective. [Q.N. 8(a)Or, 2062] $\left(\text{Ans.: (i)} \frac{1}{120} \text{ (ii)} \frac{119}{120}\right)$ State and prove the "Theorem of Compound Probability". [Q.N. 8(a), 2061] 27. A class consists of 60 boys and 40 girls. If two students are chosen at random, what en will be the probability that (a) both are boys (b) both are girls indoor and a (c) one boy and one girl? (Q.N. 8(a) Or. 20611 Ans: (i) $\frac{^{60}C_2}{^{100}C_2}$ (ii) $\frac{^{40}C_2}{^{100}C_2}$ (iii) $\frac{^{60}C_1 \sim ^{40}C_1}{^{100}C_2}$ Two dice are thrown. Determine the probability of getting a sum ≤ 5 . Ans: 5 [Q.N. 4(c), 2060] [Q.N. 8(a), 2060] 29. State and prove the "Theorem of total probability". Two letters are selected at random from the word "examination". Find the probability 30. that both of them are same letters. [Q.N. 3(c), 2059] $\left(Ans:\frac{3}{55}\right)$ Given F(A) = 0.4, P(A c B) = 0.50, P(B) = 0.3. 31. If A, B, C are three mutually exclusive events with $\frac{1}{3}$ P(A) = $\frac{2}{3}$ P(B) = $\frac{1}{6}$ P(C), find P(A); P(B); and P(C). A bag contains 6 red, 7 white and 4 black balls, A ball is di $\left(\text{Ans: } \frac{2}{7}, \frac{1}{7}, \frac{4}{7}\right)$ person by or drawing (i) a white pair (ii) not a black ball, If A and B are two independent events with P(A) = $\frac{2}{3}$ and P(B) = $\frac{3}{5}$ P(AUB). (Ans: 13) Emany - (8) 9 + (A) 9 - (8 UA) 9 - Isrti every view [Q.N. 4(c), 2058]

33. State and prove the "Theorem of total probability" ... 8 has A including [Q.N. 8(a), 2058]

34. A card is drawn at random from a well shuffled deck of 52 cards. Find the probability of being it (i) a red card (ii) a heart. [Q.N. 4(c), 2057]

$$\left(\text{Ans: (i)} \frac{1}{2} \text{ and (ii)} \frac{1}{4}\right)$$

35. State and prove the Theorem of Total probability?

11.2 Binomial Distribution

Define Binomial distribution. Find the probability of getting (i) two heads (ii) at least two 1. heads in 5 tosser of a coin. 4[Q.N.8(b), 2072'C']

 $\left(\text{Ans: (i)} \frac{5}{16} \text{(ii)} \frac{13}{16} \right)$ with the own vitage a (ii) deposit of the like energia of the second of the seco

The probability of hitting a target is found to be 0.25. If eight hits are made, find the 2. probability that (i) none will hit the target (ii) exactly two will hit the target.

6561 5103 \milteg to visit allow ent at term revent are a Ans: 65536' 16384

4[Q.N.8(b), 2072'D']

Four coins are tossed simultaneously. What is the probability of getting 4[Q.N.8(b), 2072'E'] i) 2 heads ii) 4 heads.

(Ans: (i) $\frac{3}{8}$ (ii) $\frac{1}{16}$

A dice is rolled 3 times. Getting 5 or 6 is numbered as success. Find the probability of getting (i) 2 successes (iii) 3 successes.

Suppose use in a centain ony CDN, of all recorded birth

 $\left(\text{Ans:} \frac{2}{9}, \frac{1}{27}\right)$

4[Q.N. 8(b), Set 'C' 2071]

5. Suppose that in a certain city 60% of all recorded births are males, suppose we select 5 birth records from the population. What is the probability that : i) three of them are 4[Q.N. 8(b), Set 'D' 2071] males ii) more than 4 are males.

[Ans: (i) $\frac{216}{625}$, (ii) $\frac{243}{3125}$]

A certain manufacturing process produces electrical fuses of which 15% are defective. 6. Find the probability that in a sample of 10 fuses selected at random there will be i) no 4[Q.N. 8(b), 2070 'C'] defective ii) not more than one defective.

[Ans: (i) 0.1969, (ii) 0.5443]

A coin is tossed 5 times. Find the probability of getting

i) two heads ii) atleast two hands. 4[Q.N. 8(b), 2070 'D']

(Ans: (i) $\frac{5}{16}$ (ii) $\frac{13}{16}$)

Four coins are tossed simultaneously. What is the probability of getting (i) 2 heads and 4(Q.N. 8(b), Supp. 2069] 2 tails (ii) at least 2 heads.

(Ans: (i) $\frac{3}{8}$, (ii) $\frac{11}{16}$)

If 20% of the electric bulbs manufactured by a company are defective, find the probability that out of 4 bulbs chosen at random

(i) I (ii) at most 2 bulbs will be defective. 4[Q.N. 8(b), Set 'A' 2069]

(Ans: (i) $\frac{256}{625}$ (ii) $\frac{608}{625}$

10. A dice is thrown 3 times. Getting a 2 or 3 is numbered as a success. Find the probabilities of getting two successes. [Q.N. 4(c), Set 'B' 2069]

 $\left(Ans: \frac{2}{6}\right)$

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A dice is thrown 3 times. Getting a '5' or '6' is numbered a success. Find the probability of getting (i) 3 success (ii) exactly 2 successes.

[Q.N. 8(b)(Or), 2068]

(Ans: (i) 1/27 (ii) 2/9)

 Define Binomial distribution, and its mean and variance, hence find the probability of getting three heads in five tosses of two coins. [Q.N. 8(Or), 2067]

Ans: 45/512

The probability of hitting a target is $\frac{1}{6}$, if eight hittings are made, find the probability that (i) none will strike the target, (ii) exactly two will strike the target. [Q.N. 8(a), 2066]

Ans: (i) $\frac{390625}{1679616}$ (ii) $\frac{109375}{419904}$

14. If three dices are thrown what is the probability of getting

(i) exactly 3 sixes

exactly 2 sixes, and add wardW yes constlume beautiful

[Q.N.8. (a, or), 2065]

 $\left(Ans:\frac{5}{72}\right)$

(ii)

15. Suppose that in a certain city 60% of all recorded births are males. If we select 5 births from the population, what will be the probability that:

(i) none of them is male

(ii) exactly three of them are male

[Q.N. 8(a)Or, 2064]

(Ans: (i) $\frac{243}{3125}$ (ii) $\frac{216}{625}$

16. The incidence of occupation disease in an industry is such that the workmen have a 20% chance of suffering from it. What is the probability that out of six workmen four or more will contact the disease?

 $\left(Ans.: \frac{53}{3125} \right)$

[Q.N. 8(a) Or, 2063]

17. Find the binomial distribution having mean = 12 and variance = 8.

Ans: $\left(\frac{2}{3} + \frac{1}{3}\right)^{36}$

[Q.N 4(c), 2061]

18. A sample of 100 fuses is known to have an average 5 defective fuses. Three fuses of sample are tested. What is the probability that (i) none of them is defective (ii) exactly one of them is defective?
[Q.N. 8(a) Or, 2060]

(Ans: (i) $\frac{6859}{8000}$ (ii) $\frac{1141}{8000}$

19. If 4 dice are thrown, what is probability of getting (i) exactly 3 sixes (ii) exactly 2 sixes and (iii) no sixes. [Q.N. 8(a) Or, 2059]

 $\left(\text{Ans: (i)} \frac{5}{324} \text{ (ii)} \frac{25}{216} \text{ (iii)} \frac{625}{1296}\right)$

20. The probability of hitting a target is $\frac{1}{5}$. If six hittings are made, find the probability that:

(i) none will strike the target (ii) exactly 2 will strike the target. [Q.N. 8(a) Or, 2058]

Ans: (i) 4096 (ii) 512 3125

21. A dice is thrown 3 times. Getting a '5' or '6' is numbered a success. Find the probability of getting (a) 3 successes and (b) exactly 2 successes. [Q.N. 8(b) Or, 2057]

 $\left(\text{Ans: (a)} \frac{1}{27} \text{ and (b)} \frac{2}{9}\right)$