14115 **17301**

3 Hours/100 Marks

Seat No. | | | | | | | | |

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Answer ***each*** *next main question on a* ***new*** *page.*
(3) Illustrate your answers with ***neat*** *sketches* ***wherever*** *necessary.*
(4) Figures to the ***right*** *indicate* ***full*** *marks.*
(5) Assume suitable data, if ***necessary****.*
(6) Use of Non-programmable Electronic Pocket Calculator is ***permissible****.*
(7) Mobile Phone, Pager and any other Electronic Communication devices are ***not*** *permissible in Examination Hall.*

MARKS

1. Attempt **any ten** : **20**

a) Find the gradient of the tangent of the curve $y = \sqrt{x^3}$ at $x = 4$.

b) Find the radius of curvature of the curve $y^2 = 4ax$ at point (a, 2a).

c) Evaluate : $\int (\tan x + \cot x)^2 \, dx$.

d) Evaluate : $\int \sec^2 (\log x) \frac{1}{x} dx$.

e) Evaluate : $\int x e^x dx$.

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

g) Evaluate : $\int_1^2 \frac{dx}{3x - 2}$.

h) Find the area above the x axis bounded by y = sinx and the ordinates $x = \frac{\pi}{6}$ and $x = \frac{\pi}{3}$.

P.T.O.

MARKS

i) Find the order and degree of the equation $2\frac{d^2y}{dx^2} + \left(3\sqrt{1-\left(\frac{dy}{dx}\right)^2} - y\right) = 0$.

j) Verify that $y = Ae^x + Be^{-x}$ is a solution of $\frac{d^2y}{dx^2} - y = 0$.

k) A bag contains 7 white balls, 5 black balls and 4 red balls. If two balls are drawn at random from the bag. Find the probability that both the balls are white.

l) What is the probability of getting more than 4 in a single throw of a die ?

2. Attempt **any four** : **16**

a) Find the equation of tangent and normal to the curve $4x^2 + 9y^2 = 40$ at point (1, 2).

b) A beam is bent in the form of the curve $y = 2\sin x - \sin 2x$, find the radius of curvature of the beam at this point $x = \frac{\pi}{2}$.

c) A metal wire 36 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.

d) Evaluate : $\int \frac{x-3}{x^3 - 3x^2 - 16x + 48}\,dx$.

e) Evaluate : $\int \frac{1}{x\left[9 + (\log x)^2\right]}\,dx$.

f) Evaluate : $\int \frac{\sec^2 x}{(1+\tan x)(3+\tan x)}\,dx$.

3. Attempt **any four** : **16**

a) Evaluate $\int_0^{\pi/4} x \sec^2 x\,dx$.

b) Evaluate $\int_1^2 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{3-x}}\,dx$.

c) Find the area bounded by the curve $y = x^2$ and line $y = x$.

MARKS

d) Solve : $1 - 2\frac{dy}{dx} = \cos^2(x - 2y)$.

e) Solve : $\frac{dy}{dx} = \frac{y}{x} + \sin\frac{y}{x}$.

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

4. Attempt **any four** : **16**

a) Evaluate : $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$.

b) Evaluate : $\int_0^1 x^2 \sqrt{1-x}\, dx$.

c) Find by integration the area of the circle $x^2 + y^2 = a^2$.

d) Solve : $\frac{dy}{dx} = e^{2x-3y} + 4x^2 e^{-3y}$.

e) Solve $(2xy + y^2)\, dx + (x^2 + 2xy + \sin y)\, dy = 0$.

f) Show that $y^2 = ax^2$ is a solution of $x\left(\frac{dy}{dx}\right)^2 - 2y\frac{dy}{dx} + ax = 0$.

5. Attempt **any four** : **16**

a) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $\frac{1}{7}$ and that of wife selection is $\frac{1}{5}$. What is the probability that :

1) Both of them will be selected 2) None of them will be selected.

b) The overall percentage of failures in a certain examination is 20. If six candidates appear in an examinations, what is the probability that at least five pass the examination ?

MARKS

c) A skilled typist, on routine work, kept a record of mistakes per day during 300 working days. Fit a Poisson distribution to the set of observations.

x :	0	1	2	3	4	5	6
y :	143	90	42	12	9	3	1

d) Evaluate : $\int \frac{1}{1+\sin x+\cos x}\,dx$.

e) Evaluate : $\int_0^1 x\,(1-x)^{3/2}\,dx$.

f) Solve : $\frac{dy}{dx} = -\frac{(y\cos x+\sin y+y)}{\sin x+x\cos y+x}$.

6. Attempt **any four** : **16**

a) A coin is tossed and a die is rolled. Show that the events head and six are independent and mutually exclusive.

b) If A and B are two events such that $P(A)=\frac{1}{2}$ $P(B)=\frac{1}{3}$ and $P(A\cap B)=\frac{7}{12}$. Find $P(A'\cap B')$.

c) In a sample of 1000 cases the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal. Find :

1) How many students score between 12 and 15 ?

2) How many students score above 18 ?

d) Show that equation of the tangent to the curve $\left(\frac{x}{a}\right)^m+\left(\frac{y}{b}\right)^m=2$ at the point (a, b) is $\frac{x}{a}+\frac{y}{b}=2$.

e) Divide 80 into two parts such that their product is maximum.

f) Two points A (1, 4) and B (9, 12) are on the parabola $y^2 = 16x$. Show that the area enclosed between the chord AB and the parabola is $\frac{16}{3}$.