# 17301

*Instructions* –   (1) All Questions are *Compulsory*.

(2) Figures to the right indicate full marks.

(3) Assume suitable data, if necessary.

(4) Use of Non-programmable Electronic Pocket Calculator is permissible.

(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

(6) Use of Steam tables, logarithmic, Mollier's chart is permitted.

**Marks**

**1.**   **Attempt any __TEN__ of the following:**   **20**

a) Find the point on the curve $y = 7x - 3x^2$ where the inclination of the tangent is 45°.

b) Evaluate $\int \dfrac{\cos(\log x)}{x}\, dx$

c) Find the radius of curvature of the curve $y = x^3$ at $(1, 1)$

d) Evaluate $\displaystyle\int_{1}^{2} \dfrac{dx}{2x + 5}\, dx$

e) Find order and degree of the differential equation $\dfrac{d^2 y}{dx^2} = \left( y + \dfrac{dy}{dx} \right)^{\frac{3}{2}}$

f) Evaluate $\int (e^x + x^e + e^e)\, dx$

g) Verify that $y = \log x$ is a solution of $x\dfrac{d^2 y}{dx^2} + \dfrac{dy}{dx} = 0$

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h) Evaluate $\int \log x \, dx$

i) Verify that $y = \cos x$ is a solution of $\dfrac{d^2 y}{dx^2} + y = 0$

j) In a sample of 100 bulbs, if 5% of electric bulbs manufactured by a company are defective. Using Poisson distribution find the mean.

k) An unbiased coin is tossed 6 times. Find the probability of getting 2 heads.

l) Evaluate : $\int \dfrac{1}{x + \sqrt{x}} \, dx$

m) Evaluate : $\int \dfrac{1}{x \log x} \, dx$

n) Evaluate : $\int_{2}^{4} \dfrac{1}{2x + 3} \, dx$

**2.** **Attempt any <u>FOUR</u> of the following:** **16**

a) Evaluate : $\int \dfrac{e^x (x + 1)}{\cos^2 (x e^x)} \, dx$

b) Evaluate : $\int x \tan^{-1} x \, dx$

c) Evaluate : $\int \dfrac{x^2 + 6x - 8}{x^3 - 4x} \, dx$

d) Find maxima and minima of $x^3 - 18x^2 + 96x$

e) Find the equation of the tangent and normal to the curve $2x^2 - xy + 3y^2 = 18$ at $(3, 1)$

f) A telegraph wire hanges in the form of a curve $y = a \log \sec \left( \dfrac{x}{a} \right)$ where $a$ is constant. Show that the radius of curvature at any point is $\dfrac{1}{a} \cos \left( \dfrac{x}{a} \right)$

**Marks**

**3.** **Attempt any FOUR of the following:** **16**

a) Evaluate $\displaystyle\int_0^{\pi/2} \dfrac{dx}{1+\sqrt{\tan x}}$

b) Find area bounded by the curves $y^2 = 9x$ and $x^2 = 9y$

c) Solve : $\dfrac{dy}{dx} = (x+y)^2$

d) Solve : $\dfrac{dy}{dx} = \dfrac{x^2 + y^2}{2xy}$

e) Solve : $(1+x)\dfrac{dy}{dx} - y = e^{3x}(1+x)^2$

f) Evaluate : $\displaystyle\int_0^{\pi} \dfrac{x \sin x}{1+\cos^2 x}\, dx$

**4.** **Attempt any FOUR of the following:** **16**

a) Evaluate : $\displaystyle\int_3^5 \dfrac{\sqrt{8-x}\ dx}{\sqrt{8-x}+\sqrt{x}}$

b) Evaluate : $\displaystyle\int_0^{\pi/4} \log (1+\tan x)\, dx$

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

d) Find the area enclosed between the parabola $y = x^2$ and the line $y = 4$

e) Evaluate : $\displaystyle\int \dfrac{x}{(x^2 - 1)(x^2 + 2)}\, dx$

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

**Marks**

**5.** **Attempt any FOUR of the following:** 16

a) A room has 3 electrical lamps. From a collection of 15 electric bulbs of which only 10 are good, 3 are selected at random and put in the lamps. Find the probability that the room is lighted by atleast one of the bulbs.

b) If the probability of bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals more than two will get a bad reaction. (Given $e^2 = 7.4$)

c) Fit a Poisson distribution.

| $x$ | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| $f$ | 12 | 60 | 15 | 02 | 01 |

d) Evaluate : $\int \dfrac{dx}{5 + 3\cos x}$

e) Evaluate : $\int_{0}^{\pi/2} \dfrac{1}{1 + \cot x}\, dx$

f) Solve $\dfrac{dy}{dx} = e^{3x - 2y} + x^2 e^{-2y}$

**6.** **Attempt any FOUR of the following:** 16

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

   (i)  How many students score between 12 and 15?

   (ii) How many students score above 18?

   Given   A (0.8) = 0.2881

   A (0.4) = 0.1554

   A (1.6) = 0.4452

b) If $P(A)=\frac{1}{5}, P(B')=\frac{3}{5}$ and $P\left(\frac{A}{B}\right)=\frac{3}{4}$. Find $P(A\cap B)$ and

$P\left(\frac{B}{A}\right)$

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

d) Find the area of the region lying between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$

e) Find the equation of the tangent to the curve $y = 9x^2 - 12x + 7$ which is parallel to $x$ axis.

f) The probability that a man aged 65 will live to 75 is 0.65. What is the probability that out of 10 men which are now 65, 7 will live to 75?

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