# PROVINCIAL MANAGEMENT SERVICE, ETC - 2016

SUBJECT: MATHEMATICS (PAPER-J)

TIME ALLOWED: THREE HOURS

MAXIMUM MARKS: 100

NOTE: Attempt Five Ouestions in Ail. THREE Questions from Section "A"

# SECTION - A

- **Q No. 1**: (a) Evaluate  $\lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n$ 
  - where n tends to infinity through positive integral values only.

    (b) State and prove Leibniz theorem. Find nth derivative of  $e^{x} \ln x$

(20 Marks)

- Q No. 2: a) Find (i)  $\lim_{x\to 0} (\cot x)^{\sin 2x}$ 
  - (ii)  $\lim_{x \to \frac{\pi}{2} (\frac{\tan x}{\tan 3x})}$
  - b) Evaluate (i)  $\int \frac{dx}{\sqrt{x-x^{\frac{1}{3}}}}$  (ii)  $\int_{-3}^{3} |x| dx$

(20 Marks)

(20 Marks)

- **Q.No. 3**: a) Evaluate  $\int_0^1 \int_0^x (x^2 + 4xy) dy dx$ 
  - b) Evaluate  $\iiint_v 3(x^2 + y^2 + z^2)dv$

Where s is bounded by the planes  $\,x=1$  , x=3 , y=-1 , y=1 z=2 and z=4 ,

Q No. 4: Solve the initial value problems:-

a) 
$$(x^2 + 3y^2)dx - 2xy dy = 0$$
,  $y(2) = 6$ 

b) 
$$(x^2 + 1)\frac{dy}{dx} + 4xy = x$$
,  $y(2) = 1$ 

Q No. 5:

a) A body of mass 2 slugs is dropped with no initial velocity and encounters an air resistance that is proportional to the square of its velocity. Find an expression for the velocity of the body at any time.

(b) Approximate 
$$\int_0^2 \frac{1}{\sqrt{(x^2+1)}} dx$$
 with  $n=4$   
By using rules (i) Trapezoidal (ii) Sampson's

(20 Marks)

# **Math Paper 1**

**B** Lingard

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