

**FOURTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION  
APRIL 2018**

(CCSS—SDE)

Mathematics

MM 4B 04—CALCULUS AND ANALYTIC GEOMETRY

Time : Two Hours and Forty-Five Minutes

Maximum : 27 Weightage

**Part B**

## SECTION A

*First nine question carry weightage of 1.*

1. State the “ratio test”.

2.  $\lim_{x \rightarrow 0} \frac{e^{2x} - 1}{x} =$

3. Find the focus of the parabola  $y^2 = -4x$ .4. Find the polar equation of the curve passing through origin O making an angle  $\frac{\pi}{3}$  with the initial ray.5. Find  $\frac{dy}{dx}$  if  $y = x^x$ ,  $x > 0$ .

6.  $\int \coth 3x \, dx =$

7. Show that the equation  $3x^2 - 6xy + 3y^2 + 2x - 7 = 0$  represents a parabola.8. Find the Cartesian equation corresponding to the polar equation  $r = 2$ .9. Find a series for  $\ln(1+x)$ ,  $-1 < x \leq 1$ .

(9 × 1 = 9 weightage)

**Turn over**

## SECTION B

Answer any **five** questions.  
Each question carries weightage 2.

10. Find  $\lim_{x \rightarrow \frac{\pi}{2}} (\sec x - \tan x)$ .

11. Find the directrix of the parabola  $r = \frac{25}{10 + 10 \cos \theta}$ .

12. Test the convergence of the series  $\sum_{n=1}^{\infty} \frac{n^2}{2^n}$ .

13. Find the area of the region enclosed by the circle  $r = 2 \cos \theta$ .

14. Show that  $\sinh 2x = 2 \sinh x \cosh x$ .

15. Halley's comet has an eccentricity of 0.97 and a semi major axis of  $a = 18.1$  AU. Find its perihelion and aphelion distances.

16. Find a power series for  $f'(x)$  and  $f''(x)$  if  $f(x) = \frac{1}{1 - \sin x}$ .

(5 × 2 = 10 weightage)

## SECTION C

Answer any **two** questions.  
Each question carries weightage 4.

17. Find the area of the surface generated by revolving the right-hand loop of the lemniscates  $r^2 = \cos 2\theta$  about the Y-axis.

18. Find the length of the cycloid  $x = a(t - \sin t)$ ,  $y = a(1 + \cos t)$ .

19. Evaluate :

(i)  $\lim_{x \rightarrow \infty} (1+x)^{\frac{1}{x}}$ .

(ii)  $\lim_{x \rightarrow 1^+} x^{\frac{1}{1-x}}$ .

(2 × 4 = 8 weightage)