

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018**

**TECHNICAL MATHEMATICS - II**

[Time : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer *all* questions. Each question carries 2 marks.

1. Evaluate  $\lim_{x \rightarrow 0} \frac{x^2 + 4}{x + 1}$
2. Find  $\frac{dy}{dx}$  if  $y = x^2 \sin x$ .
3. Check whether the function  $x^2 - 3x + 2$  is decreasing at  $x = 1$
4. Find  $\int (2x + 1)^2 dx$
5. Find the degree and order of the differential equation  $\left(\frac{dy}{dx}\right)^2 + y = 0$  (5×2 = 10)

PART — B

(Maximum marks : 30)

II Answer any *five* questions. Each question carries 6 marks.

1. Find the derivative of  $\sin x$  using first principles.
2. If  $x^3 + y^3 = 3xy$  find  $\frac{dy}{dx}$ .
3. Find the velocity and acceleration at time  $t = 4$  secs of a body whose displacement  $S = \frac{1}{2}t^2 + \sqrt{t}$ .
4. Find the area enclosed between the line  $2k + y = 1$  and the curve  $y = x^2 - 6x + 4$ .
5. Evaluate  $\int x \sin x dx$
6. Solve :  $x \frac{dy}{dx} + y = 3x$
7. The ellipse  $x^2/9 + y^2/4 = 1$  is rotated about the  $x$  - axis. Find the volume of the solid formed. (5×6 = 30)

PART — C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT — I

- III (a) Evaluate  $\lim_{x \rightarrow 3} \frac{x^3 - 27}{x^4 - 81}$  5
- (b) If  $y = \frac{\cos x}{x + \sin x}$ , find  $\frac{dy}{dx}$  5
- (c) If  $y = x \cos x$ , prove that  $y'' + y + 2 \sin x = 0$  5

- IV (a) If  $x = a \sec\theta$ ,  $y = b \tan\theta$ , find  $\frac{dy}{dx}$ . 5
- (b) If  $y = \frac{\sin 2x}{1+\cos 2x}$ , find  $\frac{dy}{dx}$ . 5
- (c) If  $x = a \cos^3 t$ ,  $y = b \sin^3 t$ , find  $\frac{dy}{dx}$ . 5

## UNIT — II

- V (a) If the distance 'S' meters travelled by a body in 't' seconds is given by  
 $S = 5t^2 - 20t + 12$ . Find at what time the velocity vanishes. 5
- (b) Find the range of values of x for which  $x^2 - 3x + 4$  is : 5
- (i) Increasing (ii) Decreasing
- (c) A balloon is spherical in shape. Gas is filling into it at the rate of 10 cc/sec.  
 How fast is the surface area increasing when the radius is 15 cm ? 5

OR

- VI (a) Find the equation to the tangent to the curve  $y = \cos x$  at  $x = \frac{\pi}{6}$ . 5
- (b) The deflection of the beam is given by  $y = 2x^3 - 9x^2 + 12x$ . Find maximum deflection. 5
- (c) The radius of the circular plate is increasing in length at the rate of 0.1cm/sec.  
 What is the rate at which the area increasing when the radius is 12 cm ? 5

## UNIT — III

- VII (a) Integrate  $(\tan x + \cot x)^2$  with respect to x. 5
- (b) Evaluate  $\int_0^{\frac{\pi}{2}} x \cos x \, dx$ . 5
- (c) Integrate  $\sqrt{1 - \sin 2x}$  with respect to x. 5

OR

- VIII (a) Find  $\int (\sin x + \frac{1}{x} + \operatorname{cosec}^2 x) \, dx$ . 5
- (b) Integrate  $x^2 \log x$  with respect to x. 5
- (c) Evaluate  $\int_0^{\frac{\pi}{2}} \cos^2 x \, dx$ . 5

## UNIT — IV

- IX (a) Find the area bounded by the curve  $y = x^2 - 5x + 6$  and the x-axis. 5
- (b) Find the volume generated by the rotation of the area bounded by the curve  
 $y = 2x^2 + 1$ , the Y-axis and the lines  $y = 3$ ,  $y = 9$  about Y-axis. 5
- (c) Solve  $dx(1 + y^2) = dy(1 + x^2)$ . 5

OR

- X (a) Find the area bounded by the curve  $y = x^2 + x$  and the x-axis. 5
- (b) Find the volume of a sphere of radius 'r' using integration. 5
- (c) Solve  $\frac{dy}{dx} + y \tan x = \sec x$ . 5