

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

OR

- 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 :
 (i) Increasing (ii) Decreasing 5
- (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