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# DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2018

# **ENGINEERING MATHEMATICS - I**

[Time : 3 hours

(Maximum marks : 100)

## PART — A

(Maximum marks : 10)

Marks

 $(5 \times 2 = 10)$ 

- I Answer all questions. Each question carries 2 marks.
  - I. Find the value of  $\tan^2 60 + \tan^2 45$ .
  - 2. If  $\tan \theta = 3$ , find  $\sin 2\theta$ .
  - 3. Find the area of a triangle given, b = 3cm, c = 2cm and  $A = 30^{\circ}$ .
  - 4. Evaluate  $\lim_{x \to 3} \frac{x^2 + 9}{x + 3}$
  - 5. For what values of x, the function  $x^2 5x + 6$  is increasing ?

# PART — B

### (Maximum marks : 30)

- II Answer any five of the following questions. Each question carries 6 marks.
  - 1. Find the value of tan 75, without using tables and show that tan  $75 + \cot 75 = 4$ .
  - 2. The horizontal distance between two towers is 60 m and the angle of depression of the first tower as seen from the second which is in 150 m height is 30°. Find the height of the first tower.
  - 3. Prove that  $\cos\frac{\pi}{8} + \cos\frac{3\pi}{8} + \cos\frac{5\pi}{8} + \cos\frac{7\pi}{8} = 0$
  - 4. Solve  $\triangle ABC$ , given a = 4cm, b = 5cm, c = 7cm.
  - 5. Find the second derivative of  $x^2 \log x$ .
  - 6. Differentiate 'sin x' by the method of first principles.
  - 7. If S denotes the displacement of a particle at the time 't' seconds and  $S = t^3 - 6t^2 + 8t - 4$ .
    - (i) Find the time when the acceleration is 12cm/sec<sup>2</sup>.
    - (ii) The velocity at that time.

 $(5 \times 6 = 30)$ 

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#### Marks

5

5

5

5

5

5

5

5

5

# PART - C

### (Maximum marks : 60)

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

|--|

- (b) If tan A = 3/4, sin B = 5/13. (A lies in the third quadrant and B lies in the second quadrant.) Find sin (A-B) and cos (A+B).
- (c) Evaluate cos 570 sin 510 sin 330 cos 390.

OR

IV (a) Prove that 
$$\frac{1 + \sin A}{\cos A} = \frac{\cos A}{1 - \sin A}$$

- (b) Express  $\sqrt{3} \sin x + \cos x$  in the form of R sin  $(x + \alpha)$  where  $\alpha$  is acute.
- (c) Prove that  $\sin (A + B) \sin (A B) = \sin^2 A \sin^2 B$ .

Unit — II

V (a) Prove that 
$$\frac{\sin 3A - \sin A}{\cos 3A + \cos A} = \tan A$$
5(b) Prove that  $\cos 80 \cos 60 \cos 40 \cos 20 = 1/16$ 5

(c) Show that a  $(b^2 + c^2) \cos A + b (c^2 + a^2) \cos B + c (a^2 + b^2) \cos C = 3abc$ 

Or

- VI (a) Prove that  $\frac{\cot A \tan A}{\cot A + \tan A} = \cos 2A$  5
  - (b) Show that  $\sin 40 \sin 80 + \sin 20 = 0$
  - (c) Two angles of a triangular plot of land are 53° and 67° and the side between them is measured to be 100cm. How many meters of fencing is required to fence the plot?

VII (a) Evaluate (i) 
$$\lim_{x \to \infty} \frac{3x+5}{x-2}$$
 (ii) Evaluate  $\lim_{x \to 3} \frac{x^2-9}{x-3}$  (3+2)

(b) Find 
$$\frac{dy}{dx}$$
 if (i)  $x = at^2$ ,  $y = 2at$ .  
(ii)  $y = \frac{\sin 2x}{1 + \cos 2x}$  (3 + 2)

(c) If y = a sin x + b cos x. Prove that  $\frac{d^2y}{dx^2} + y = 0$ 

Or

5

5



			Marks
VIII	(a)	Find the derivative of 'sec x' using quotient rule.	5
	(b)	Find $\frac{dy}{dx}$ if (i) $y = \log(\sin \sqrt{x})$ (ii) $y = (x^3 + 3) \tan^{-1} x$	(3+2)
	(c)	If $ax^2 + by^2 + 2gx + 2fy + c = 0$ , find $\frac{dy}{dx}$	5
		Unit IV	
IX	(a)	Find the equation to the tangent and normal to the curve $y = x^2 + 2x - 3at$ (2,5).	5
	(b)	A circular plate of radius 3 inches expands when heated at the rate of 2 inches/second. Find the rate at which the area of the plate is increasing at the end of 3 seconds.	5
	(c)	The deflection of a beam is given by $y = 2x^3 - 9x^2 + 12x$ . Find the maximum deflection.	5
		Or	
х	(a)	Find the values of 'x' for which the tangent to the curve $y = x$	
		will be parallel to the x – axis. $(1-x)^2$	5
	(b)	A balloon is spherical in shape. Gas is escaping from it at the rate of 10 cc/sec. How fast is the surface area shrinking when the radius is 15 cm ?	5

(c) The perimeter of a rectangle is 100 m. Find the sides when the area is maximum.



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