4002

BOARD DIPLOMA EXAMINATION, (C-14)

MARCH / APRIL - 2019

FIRST YEAR (COMMON) EXAMINATION

ENGINEERING MATHEMATICS - I

Time : **3** Hours]   [Total Marks : **80**

PART - A   **4×10=40**

Instructions :   *(1)   Answer **ALL** questions.*

                              *(2)   Each question carries **FOUR** marks (Two marks for each bit).*

                              (3)   Answer should be brief and straight to the point and shall not exceed five simple sentences.

1   (a)   Write the types of fractions.

      (b)   If $\dfrac{x}{(x+1)^2} = \dfrac{1}{x+1} + \dfrac{A}{(x+1)^2}$, then find A.

2   (a)   If $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, find $7A$.

      (b)   Define Transpose of a matrix A.

3   (a)   If $\begin{vmatrix} 2 & 1 \\ 3 & x \end{vmatrix} = 1$, find x.

      (b)   Find the value of $\begin{vmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{vmatrix}$.

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4 (a) Find $\sin 75°$.

(b) If $\tan A = \dfrac{3}{4}$, find $\sin A \cos A$.

5 (a) Simplify $\tan(45 + A) \, \tan(45 - A)$.

(b) Simplify $\sqrt{\dfrac{1 - \cos 2A}{1 + \cos 2A}}$.

6 (a) Find the modulus of $\dfrac{1 + i}{1 - i}$.

(b) If $z = \cos\theta + i\sin\theta$, find z^4.

7 (a) Write the equation of straight line perpendicular to $ax + by + c = 0$ and passing through $(x_1, \, y_1)$.

(b) Find the equation of a straight line making intercepts 3 and 4.

8 (a) Find the equation of circle whose centre (3, 2) and radius 2.

(b) Find the equation of point circle with centre (11, 3).

9 (a) Evaluate $\displaystyle \operatorname*{lt}_{x \to 0} \dfrac{2x^3 - 3x^2 + 1}{9x^2 + 8x + 7}$.

(b) Evaluate $\displaystyle \operatorname*{lt}_{x \to 0} \dfrac{\tan 11x}{x}$.

10 (a) Differentiate xe^x w.r.t. $'x'$.

(b) Differentiate $\log x \cdot \tan x$ w.r.t. $'x'$.

PART - B   10×4=40

Instructions :   (1) *Answer any **FOUR** questions.*

(2) *Each question carries **TEN** marks.*

(3) *Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.*

11 (a) Using the Laplace's expansion, evaluate $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}$.

(b) Solve the equations by Cramer's rule

$$x + 2y - z = -3$$
$$3x + y + z = 4$$
$$x - y + 2z = 6$$

12 (a) Prove that $\dfrac{\sin 8A + \sin 4A}{\cos 8A + \cos 4A} = \tan 6A$.

(b) Prove that $\tan^{-1}\dfrac{1}{3} + \tan^{-1}\dfrac{1}{7} = \tan^{-1}\dfrac{1}{2}$.

13 (a) Solve $\cos\theta + \sqrt{3}\,\sin\theta = 1$.

(b) In any triangle *ABC,* prove that $\sum a \sin(B - C) = 0$.

14 (a) Find the equation of Parabola with focus at $(1, -1)$ and directrix is the line $3x + 4y + 5 = 0$.

(b) Find the center, eccentricity, focus, directrices and length of latus rectum of ellipse $4x^2 + 9y^2 = 36$.

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15 (a) Find $\dfrac{dy}{dx}$ if $y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + ---\infty}}}$.

(b) Find $\dfrac{dy}{dx}$ if $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$.

16 (a) Find derivative of $e^{\tan^{-1}x}$ with respect to $\tan^{-1}x$.

(b) If $Z = ax^2 + by^2 + 2hxy$ then prove that $x\dfrac{\partial z}{\partial x} + y\dfrac{\partial z}{\partial y} = 2z$.

17 (a) Find the length of tangent, normal, sub tangent and subnormal to the curve $x^2 + y^2 - 6x - 2y + 5 = 0$ at the point $(2, -1)$.

(b) A particle is moving along a straight line according to the law $s = 2t^3 - 3t^2 + 15t + 18\,(t$ is in sec.$)$, find its velocity when its acceleration is zero.

18 (a) The sum of two numbers is 36. Find them so that their product is maximum.

(b) The radius of a spherical balloon is increased by 1%. Find the approximate percentage increase in its surface area.

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