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C16-COMMON–102

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BOARD DIPLOMA EXAMINATION, (C-16)

JANUARY/FEBRUARY—2022

FIRST YEAR (COMMON) EXAMINATION

ENGINEERING MATHEMATICS - I

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

PART—A 3×10=30

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

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

1. Resolve $\frac{1}{(x-1)(x-2)}$ into partial fractions.

2. If $A=\begin{bmatrix}1 & -1\\ 1 & 1\end{bmatrix}$ and $B=\begin{bmatrix}2 & 3\\ 1 & 3\end{bmatrix}$, then find $A+B$ and $A-B$.

3. If $A=\begin{bmatrix}-1 & 1\\ 1 & 2\end{bmatrix}$, the find Adjoint of A.

4. Show that $\frac{\cos^2 A}{\sin^2 A}=\frac{\cot A}{2}$.

5. Show that $\sin 70°\cos 10°-\cos 70°\sin 10°=\frac{\sqrt{3}}{2}$.

6. Find the modulus of $z=-1-3i$.

7. Find the slope of line joining two-points $(1, 0)$ and $(0, 2)$.

8. Find x and y intercepts of the straight line $\frac{x}{2}+\frac{y}{3}=1$.

9. Evaluate $\lim_{\theta\to 0}\frac{\sin m\theta}{\tan n\theta}$.

10. If $y=e^x+\log x+x$, then find $\frac{dy}{dx}$.

PART—B

10×5=50

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

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

11. *(a)* Solve the following system of linear equations by using Cramer's rule :

$3x+y+2z=3$, $2x-3y-z=-3$ and $x+2y+z=4$

(b) If $A=\begin{bmatrix}1 & -1 & 0\\ 2 & 1 & 3\\ 4 & 1 & 8\end{bmatrix}$ and $B=\begin{bmatrix}4 & 1 & 0\\ 2 & -3 & 1\\ 1 & 1 & -1\end{bmatrix}$ show that $(A+B)^T=A^T+B^T$.

12. *(a)* Show that $\frac{\sin A+\sin 2A+\sin 3A}{\cos A+\cos 2A+\cos 3A}=\tan 2A$.

(b) Show that $\tan^{-1}\left(\frac{1}{2}\right)-\tan^{-1}\left(\frac{1}{3}\right)=\frac{\pi}{4}$.

13. *(a)* Solve $2\sin^2\theta+\sin\theta-1=0$.

(b) In a ΔABC, show that $(b-c)\sin A+(c-a)\sin B+(a-b)\sin C=0$.

14. *(a)* Find the equation of the circle having (4,2) and (1,5) as the extremities of the diameter.

(b) Find the eccentricity, foci, length of major and minor axes, vertices of an ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$.

15. *(a)* If $y=\sqrt{\sin x+\sqrt{\sin x+\sqrt{\sin x+\ldots\infty}}}$ times, then find $\frac{dy}{dx}$.

(b) If $y=\sin^{-1}(3x-4x^3)$, then find $\frac{dy}{dx}$.

16. *(a)* If $x=at^2$ and $y=2at$, then find $\frac{dy}{dx}$.

(b) If $u=x^3+y^3$, then find $\frac{\partial^2 u}{\partial x^2}$ and $\frac{\partial^2 u}{\partial y^2}$.

17. *(a)* Find the lengths of tangents, normal, sub-tangent and sub-normal to the curve $y=x^3$ at (1,1).

(b) Find the maximum and minimum values of $4x^3-18x^2+24x-7$.

18. *(a)* If $s=t^2-4t+3$ then find the velocity and acceleration when t = 4 secs, s is displacement.

(b) If the radius of a spherical balloon is increased by 0.1%, then find the approximate increase in its volume.

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