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C16–EC/CHPC/PET–102

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BOARD DIPLOMA EXAMINATION, (C–16)

OCTOBER—2020

DECE—FIRST YEAR 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 $\frac{1}{(x-8)(x+1)}$ into partial fractions.

2. If $A=\begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix}$ and $B=\begin{bmatrix} 3 & -1 \\ 2 & 0 \end{bmatrix}$, then find $3A-2B$.

3. Evaluate $\begin{vmatrix} 8 & 2 & 5 \\ 2 & -1 & 9 \\ 7 & 4 & 12 \end{vmatrix}$, using Laplace expansion.

4. If $\tan A=\frac{m}{m+1}$ and $\tan B=\frac{1}{2m+1}$, where A and B are acute angles, then find $A + B$.

5. Prove that $\cos x \cdot \cos(60°-x) \cdot \cos(60°+x)=\frac{1}{4}\cos 3x$.

6. Find the real and imaginary parts of the complex number $(1+3i)(2+i)$.

7. Find the slope of a line passing through the points $A(3,-7)$ and $B(2,-5)$ and also find its equation.

8. Find the equation of the straight line passing through the point $(3,-7)$ and parallel to the line $2x+3y+5=0$.

9. Evaluate $\lim_{x\to 4}\left(\frac{x^3-64}{x^2-16}\right)$.

10. Find the derivative of x^7+7^x+7x with respect to x.

PART—B

10×5=50

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

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

11. Solve the equations

$$x-y+z=2,\ 2x+3y-4z=-4 \text{ and } 3x+y+z=8$$

using matrix inversion method.

12. *(a)* Prove that, $\cos A+\cos(120°+A)+\cos(120°-A)=0$.

(b) If $\cot^{-1}\left(\frac{1}{x}\right)+\cot^{-1}\left(\frac{1}{y}\right)+\cot^{-1}\left(\frac{1}{z}\right)=\frac{\pi}{2}$, then show that $xy+yz+zx=1$.

13. *(a)* Solve the equation, $\cot^2 x-1=\operatorname{cosec} x$.

(b) In a $\Delta^{le} ABC$ prove that $\sum(a+b)\cos c=2s$.

14. *(a)* Find the equation of the circle whose center is at the point $(2,-3)$ and radius is 4 units.

(b) Find the center, vertices, eccentricity, foci and length of latus rectum of the ellipse

$$\frac{x^2}{9}+\frac{y^2}{36}=1$$

15. *(a)* Find $\frac{dy}{dx}$, if $y=\tan^{-1}\left(\sqrt{\frac{1-\cos 2x}{1+\cos 2x}}\right)$.

(b) Find $\frac{dy}{dx}$, if $y=x^{\log x}$.

16. *(a)* If $y=\sin(\log x)$, then show that $x^2y_2+xy_1+y=0$.

(b) If $u(x,y)=\log(xy+y^2)$, then show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=2$.

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

(b) A circular metal expands by heat so that its radius increases at the rate of 1·5 cm/sec. Find the rate of increase of its area when the radius is 12 cm.

18. *(a)* Find the maximum and minimum values of $f(x)=2x^3-9x^2+12x+15$.

(b) If time and length of a simple pendulum is given by the equation

$$T=2\pi\sqrt{\frac{l}{g}}$$

where g is constant. Find the approximate percentage error in the calculated value of T corresponding to an error 0·4% in the value of l.

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