

B.C.A. (Ist – Semester) Examination, 2018

Paper V : Mathematics (BCA 105)

Note: Attempt any five questions. All questions carry equal marks.

Note: The answer to short questions should not exceed 200 words and the answer to long questions should not exceed 500 words.

1. (a) Expand the determinant :

7

$$\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}$$

By the elements of first row.

- (b) For the matrix $A = \begin{bmatrix} 2 & \sqrt{2} \\ \sqrt{2} & 1 \end{bmatrix}$ find the eigenvalues and eigenvectors.

8

2. (a) Find the limit

$$\lim_{x \rightarrow 2} \frac{x^5 - 32}{x^3 - 8}$$

- (b) Show that the function $f(x) = \sin x$ is continuous for all real values of x .

8

3. (a) State and prove the intermediate value theorem

7½

- (b) Examine the differentiability of the function

7½

$$f(x) = \begin{cases} 0; & x \leq 0 \\ x; & x > 0 \end{cases}$$

4. (a) State and prove Rolle's Theorem.

7½

- (b) Evaluate

7½

$$\lim_{x \rightarrow 0} \left(\frac{x - \tan x}{x^2} \right)$$

5. (a) (i) Evaluate $\int \log x dx$ 4
(ii) Find the value $\int x^2 \sin 2x dx$. 4
(b) Using the reduction formula 7

$$I_{m,n} = \frac{n-1}{m+n} I_{m,n-2}$$

evaluate $\int_0^{2\pi} \sin^6 x \cdot \cos^4 x dx$.

6. (a) Prove that $B(m, n) = B(n, m)$. 7
(b) Trace the curve : 8

$$\frac{a^2}{x^2} - \frac{b^2}{y^2} = 1$$

7. (a) Prove that : <http://www.mgkvponline.com> 7

$$\vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) + \vec{c} \times (\vec{a} \times \vec{b}) = 0$$

- (b) Prove that : 4

(i) $[a\hat{i} b\hat{j} c\hat{k}] = abc$. 4

(ii) $\vec{a} \cdot (\vec{a} \times \vec{b}) = 0$ for any two vectors \vec{a} and \vec{b} . 4