

Name :

Roll No. :

Invigilator's Signature :

CS / BBA(H)BIRM / BSCM / SEM-2 / BBA-202 / 2013

2013

MATHEMATICS-II

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

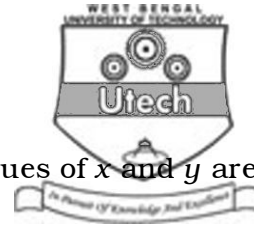
i) The value of the

$$\lim_{x \rightarrow 0} (1 + x)^{\frac{1}{x}} \text{ is equal to}$$

- | | |
|------|---------------|
| a) 1 | b) e |
| c) 0 | d) ∞ . |

ii) The curve $y = |x|$ is symmetric about

- | | |
|---------------|-------------------|
| a) x – axis | b) y – axis |
| c) $y = x$ | d) none of these. |



iii) if $\begin{pmatrix} 7 & x+y \\ 8 & x-y \end{pmatrix} = \begin{pmatrix} 7 & 5 \\ 8 & 3 \end{pmatrix}$, then the values of x and y are

- a) $x = 4, y = 1$ b) $x = 3, y = 2$
 c) $x = 1, y = 4$ d) $x = 0, y = 5$.

iv) A function $f(x)$ is said to be odd if $f(-x)$ is equal to

- a) $f(x)$ b) $-f(x)$
 c) $-f(-x)$ d) none of these .

v) The rank of the matrix

$$\begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{pmatrix} \text{ is}$$

- a) 1 b) 2
 c) 3 d) None of these.

vi) The parametric coordinates of the parabola

$$y^2 = 4ax \text{ are}$$

- a) $(at^2, 2at)$ b) $(-at^2, -2at)$
 c) $(-at^2, 2at)$ d) none of these.

vii) The function $f(x, y) = \frac{x^3 + y^3}{x^2 + y^2}$ is homogeneous of degree

- a) 1 b) 2
 c) 3 d) none of these.



3. If ω is imaginary cube root of 1, show that $a + b\omega + c\omega^2$ is a factor of

$$\Delta = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}.$$

4. Find the points on the curve $y = x + \frac{1}{x}$ at which the tangents to the curve are parallel to x -axis.

5. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$.

6. Evaluate $\lim_{x \rightarrow 1} (1-x) \tan \frac{x\pi}{2}$.

7. Evaluate $\int_0^1 e^x dx$ as the limit of a sum.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. a) Find the coordinates of the foci of the ellipse

$$3x^2 + 4y^2 = 12$$

- b) Without expanding show that

$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (b-c)(c-a)(a-b).$$



c) If $y = (\cos^{-1} x)^2$, show that

$$(1 - x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} = 2 .$$

9. a) Find the equation of the parabola where vertex is at the origin, the axis on the y -axis and which passes through the point (6, - 3).

b) If $f (x) = (x - 1) e^x + 1$, show that $f (x)$ is an increasing function of x for all positive values of x .

c) Find the area bounded by the ellipse

$$4x^2 + 9y^2 = 36 \text{ and the } x \text{-axis.}$$

10. a) Examine whether the following matrix

$$A = \frac{1}{3} \begin{pmatrix} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$$

is orthogonal.

b) Show that all rectangles of a given perimeter, the square has the maximum area.

c) Differentiate

$$\sin^{-1} \frac{2x}{1+x^2} \text{ with respect to } \tan^{-1} \frac{2x}{1-x^2} .$$



11. a) State and prove Euler's theorem for a homogeneous function of two variables.

b) Integrate $\cos^2 x$ with respect to x .

c) Evaluate :

$$\lim_{x \rightarrow \infty} \left(\frac{1^2 + 2^2 + 3^2 + \dots + n^2}{n^3} \right).$$

12. a) Find the equation of the ellipse whose latus rectum is 5 and whose eccentricity is $\frac{2}{3}$, the axes of the ellipse being the coordinate axes.

b) Examine the continuity of the following function $f(x)$ at $x = 0$, where $f(x)$ is defined by

$$\begin{aligned} f(x) &= \frac{\sin 3x}{2x}, \text{ for } x \neq 0 \\ &= \frac{2}{3}, \text{ for } x = 0 \end{aligned}$$

c) If a function $f(x)$ is defined by

$$f(x) = \frac{1-x}{1+x}, \text{ find } f\left(f\left(\frac{1}{x}\right)\right), \text{ for } x \neq 0.$$

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