Name :	
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Invigilator's Signature :	

CS/BCA/SEM-1/BM-101/2010-11 2010-11 MATHEMATICS

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 Type Questions)

- 1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$
 - i) $\lim_{x \to 0} (1+x)^{1/x} = ?$ a) 1 b) 0 c) $\frac{2}{3}$
 - d) *e*.
 - ii) If α , β , χ be the roots of the equation x + yn = 2 then $\Sigma x^2 =$
 - a) 0 b) 14
 - c) -14 d) 4.

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CS/BCA/SEM-1/BM-101/2010-11 An element x in a ring R is zero divisor if iii) x . b = 0a) x . b = 0, for some non zero element b in Rb) $x \cdot b \neq 0$, for all element b in Rc) d) none of these. The value of $\int_{-1}^{2} |x| dx$ is iv) a) 3 b) 5 c) $\frac{5}{2}$ d) 0. The value of $\frac{d}{dx}(\log_e x)$ is equals to V) a) $\frac{1}{x}$ b) $\log\left(\frac{1}{x}\right)$ d) $a \log e$. c) $\left(\frac{1}{n}\right)\log_a e$ If $A = \{ 2, 4, 6 \}$ and $B = \{ 1, 3, 5, 7 \}$, then $A \cup B$ is vi) { **0** } b) $\{1, 2, 3, 4, 5, 6, 7\}$ a) c) $\{1, 2, 4, 5, 6, 7\}$ d) $\{0, 2\}.$ If A is a square matrix then vii) $A + A^T$ is symmetric a) b) $A + A^T$ is skew symmetric c) $A - A^T$ is symmetric d) $A - A^T$ is skew symmetric.

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viii)	The	matrix $A = \begin{pmatrix} 1/\sqrt{2} & -1/\sqrt{2} \\ 1/\sqrt{2} & 1/\sqrt{2} \end{pmatrix}$	$\left(\sqrt{2} \right) \left(\sqrt{2} \right)$	is on
	a)	orthogonal matrix	b)	idempotent matrix
	c)	identity matrix	d)	none of these.
ix)	If y	= 2 at and $x = at^2$, then	$\frac{\mathrm{d}y}{\mathrm{d}x}$	at $t = 1$ is
	a)	1	b)	2a
	c)	- 1	d)	$2a^2$.
X)	The polar form of the equation $x^2 + y^2 - 8y = 0$ is			
	a)	$r = 8 \cos \theta$	b)	$r=8\sin\theta$
	c)	$r^2 = 8 \cos \theta$	d)	none of these.
xi)	If $A = \{ 1, 2, 3, 4, 8 \}, B = \{ 2, 4, 6, 7 \}$ then $A \Delta B$ is			6, 7 } then $A \Delta B$ is
	a)	$\{2,4\}$		
	b)	$\{1,2,3,4,6,7,8\}$		
	c)	φ		
	d)	$\{ 1, 3, 6, 7, 8 \}.$		
xii)	The	diagonal elements of a	ı real	skew-symmetric matrix
	are			
	a)	1	b)	- 1
	c)	2	d)	0.
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GROUP – B (Short Answer Type Questions)

Answer any three of the following.

A function f(x) is defined as follows 2.

$$f(x) = x^{2} \qquad \text{when } 0 < x < 1$$
$$= x \qquad \text{when } 1 \le x < 2$$
$$= 2 - x \qquad \text{when } 2 \le x < 3$$

Show that the f(x) is continuous at x = 2.

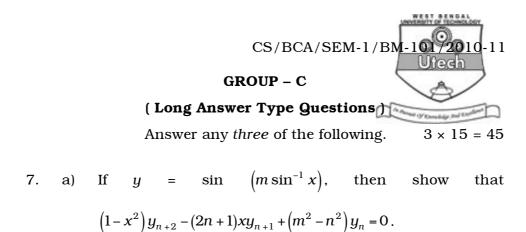
3. Evaluate
$$\int_{0}^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{\sin x} + \sqrt{\cos x}} \, \mathrm{d}x.$$

If α , β , γ be the roots of the cubic $x^3 + px + q = 0$, then find the 4. equation whose roots are

$$\frac{\beta+\gamma}{\alpha^2}, \, \frac{\gamma+\alpha}{\beta^2}, \frac{\alpha+\beta}{\gamma^2}.$$

- Prove that the ring of matrices of the form $\begin{bmatrix} x & y \\ -y & x \end{bmatrix}$ of real 5. number is a field.
- In a survey concerning the smoking habits of consumers it 6. was found that 55% smoke cigarette-A, 50% smoke 42% cigarette-C, cigarette-B, smoke 28%smoke cigarette-A & B, 20% smoke cigarette-A & C, 12% smoke cigarette-*B* & *C* and 10% smoke all the three cigarette. What percentage do not smoke?

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b) If α , β , γ are the 3 roots of $x^3 + px^2 + qx + r = 0$ obtain the value of $\sum (\alpha - \beta)^2$.

c) Evaluate
$$\int \frac{1}{x^2} e^{1/x} dx$$
.

8. a) If
$$u = \frac{y}{z} + \frac{z}{x} + \frac{z}{y}$$
 then prove that, $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$.

- b) If by a rotation of rectangular co-ordinate axes without change of origin expressions ax + by and cx + dy are transformed into a' x' + b' y' and c' x' + d' y'. Show that a' d' - b' c' = ad - bc.
- c) Reduce the following equation to its canonical form and determine the nature of the conic represented by it :

$$3x^2 - 8xy - 3y^2 + 10x - 13y + 18 = 0$$

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9. a) Evaluate



- $\lim_{n \to \infty} \left[\frac{n}{n^2 + 1^2} + \frac{n}{n^2 + 2^2} + \dots + \frac{n}{n^2 + n^2} \right].$
- Using mean value theorem prove the following b) inequality :

$$x \left\langle \sin^{-1} x \left\langle \frac{x}{\sqrt{1-x^2}} \right\rangle \right.$$
 if $0 < x < 1$

Expand $\sin x$ in power of x in infinite series. c)

10. a) Solve the equation by Cardan's method :

$$2x^3 + 3x^2 + 3x + 1$$

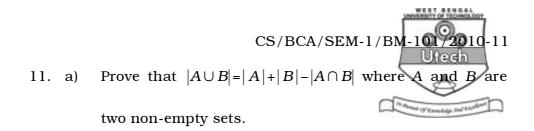
Evaluate b)

$$\int \frac{x^2 \,\mathrm{d}x}{\left(x^2 + a^2\right) \left(x^2 + b^2\right)}$$

c) If
$$y = x^{x-1} \log x$$
, show that $y_x = \frac{(x-1)!}{x}$.

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- b) If $A = \{a, b, c, d\} B = \{b, c, p, q\}$, then find out $A \times B$, $B \times A$ and $A \Delta B$.
- c) Define power set. Find the power set of $\{a, b, c\}$.