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BCACAC 208

**Credit Based Third Semester B.C.A. Degree Examination,
October/November 2017
(Common to All Batches)
BASIC MATHEMATICS**

Time : 3 Hours

Max. Marks : 80

Note: Answer *any ten* questions from Part – A and *one full* question from *each* Unit of Part – B.

PART – A

(10×2=20)

1. a) $x = \log_7 27$, $y = \log_5 7$, $z = \log_3 5$ prove that $x.y.z = 3$.
- b) Find the coordinates of the centroid whose vertices are (2, 3) (–5, 2) and (1, 7).
Find the distance between (5, 5) (–3, 3).
- c) Find the centre and radius of the circle whose equation is
 $x^2 + y^2 - 2x - 6y + 7 = 0$.
- d) Represent the following angles in radians (i) 60° (ii) 40° .
- e) If $y = 2x + x^2$ what is $\frac{dy}{dx}$?
- f) Integrate $(x^2 - 1)^2$.
- g) $A = \{1, 2, 6, 7\}$, $B = \{2, 3, 4, 6, 7\}$ what is $A + B$?
- h) Represent $A \cup B$ and $\sim A$ using Venn diagram.
- i) $A = \{1, 2, 3\}$, $B = \{a, b\}$ write $A \times B$ and $B \times A$.
- j) Define null graph with an example.
- k) Define binary tree with example.
- l) Define multi-graph with example.

P.T.O.



PART - B

Unit - I

2. a) Prove that $\frac{\log\sqrt{27} + \log\sqrt{8} - \log\sqrt{125}}{\log 6 - \log 5} = \frac{3}{2}$.

b) Find the middle term in the expansion of $\left(x - \frac{1}{x}\right)^{18}$.

c) Prove that the points (4, 1) (7, 4) and (13, -2) form a right angled triangle.

(5+5+5)

3. a) Show that $\log\frac{81}{8} - 2\log\frac{3}{2} + 3\log\frac{2}{3} + 3\log\frac{3}{4} = 0$.

b) Find the coordinates of a point which divides the line joining two points P(8, 9) and Q(-7, 4) internally in the ratio 2 : 3 and externally in the ratio 4 : 3.

c) Find the equation of straight line passing through the point (-1, -5) and
(i) parallel (ii) perpendicular to the line $2x + 3y - 5 = 0$.

(5+5+5)

Unit - II

4. a) If $\sin\theta = \frac{15}{17}$ and θ is an acute angle find the values of other trigonometric functions.

b) Evaluate $\lim_{x \rightarrow 2} \frac{2x^2 - 7x + 6}{5x^2 - 11x + 2}$.

c) Differentiate $9x^4 - 7x^3 + 8x^2 - \frac{8}{x} + \frac{10}{x^3}$ with respect to x.

(5+5+5)



5. a) Express both in degrees and radians the angles of a triangle whose angles are to each other as 2 : 3 : 5.

b) Determine x if $x \sin 30^\circ \cdot \cos^2 45^\circ = \frac{\cot^2 30^\circ \sec 60^\circ \tan 45^\circ}{\operatorname{cosec}^2 45^\circ \operatorname{cosec} 30^\circ}$.

c) Evaluate (i) $\int (4x^3 + 3x^2 - 2x + 5) dx$ (ii) $\int_6^{10} \left(\frac{dx}{(x+2)} \right)$. (5+5+5)

Unit - III

6. a) $A = \{3, 4, 5, 17\}$, $B = \{1, 2, 3\}$, $C = \{x | X \text{ is an integer and } 0 \leq x \leq 5\}$ write $A \cup B$, $A \cup C$, $B - C$, $A - C$, $A \cup (B \cap C)$.

b) $R = \{\langle 1, 2 \rangle, \langle 3, 4 \rangle, \langle 2, 2 \rangle\}$, $S = \{\langle 4, 2 \rangle, \langle 2, 5 \rangle, \langle 3, 1 \rangle, \langle 1, 3 \rangle\}$ write $R \circ S$, $R \circ R$, $S \circ S$, $S \circ R$ and $R \circ (S \circ R)$.

c) Define surjective, injective and bijective functions with example. (5+4+6)

7. a) Given the relation matrices $M_R = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ $M_S = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$

Find $M_{R \circ S}$, $M_{\bar{R}}$, $M_{\bar{S}}$, $M_{\bar{R \circ S}}$ and show that $M_{\bar{R \circ S}} = M_{\bar{S}} \circ M_{\bar{R}}$.

b) Prove that R is an equivalence relation.

c) Let $X = \{1, 2, 3\}$ f, g, h and s are the functions from X to X given by

$$f = \{\langle 1, 2 \rangle, \langle 2, 3 \rangle, \langle 3, 1 \rangle\} \quad h = \{\langle 1, 1 \rangle, \langle 2, 2 \rangle, \langle 3, 1 \rangle\}$$

$$g = \{\langle 1, 2 \rangle, \langle 2, 1 \rangle, \langle 3, 3 \rangle\} \quad s = \{\langle 1, 1 \rangle, \langle 2, 2 \rangle, \langle 3, 3 \rangle\}$$

Find $f \circ g$, $g \circ f$, $s \circ s$, $f \circ h \circ g$, $s \circ g$ and $f \circ s$.

(5+4+6)



Unit - IV

8. a) What are strongly connected, weakly connected and unilaterally connected graphs? Explain with suitable examples.
- b) Define following terms with an example :
- isomorphic graphs
 - simple path.

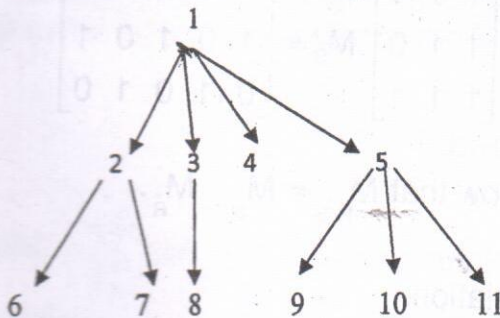
- c) $A = \{1, 2, 3, 4\}$ and R be a relation on A that has the matrix $M_R =$

$$M_R = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

construct relational graph of R and write in-degree and out-degrees of all the nodes.

(6+4+5)

9. a) Define (i) simple graph (ii) parallel edges (iii) cyclic graph, with example.
- b) Define (i) isolated vertex (ii) undirected graph with example.
- c) Convert the following trees into a binary tree :



(6+4+5)