Roll No. ☐☐☐☐☐☐☐☐☐☐☐   **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(BT) (2011 Onwards)   (Sem.–3)
MATHEMATICS
Subject Code : BTBT-301
Paper ID : [A1154]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION–A

1. **Answer briefly :**

   a) Find the centre and the radius of the circle $x^2 + y^2 + 8x + 10y - 8 = 0$.

   b) Find rank of $\begin{bmatrix} 1 & 4 & 5 \\ 2 & 6 & 8 \\ 3 & 7 & 22 \end{bmatrix}$.

   c) Which term of the A.P. 1, 6, 11, 16,…..is 301 ?

   d) Find the equation of the tangent to the parabola $y^2 = 2x$ which is perpendicular to $4x - y + 1 = 0$.

   e) How many permutations of the letter of word APPLE are there?

   f) Find the inverse of the matrix $\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$.

   g) In what ratio, the line joining (1, 3) and (2, 7) is divided by $3x + y = 9$?

   h) Prove that $\cos(A + B)\cos(A - B) = \cos^2 A - \sin^2 B$.

   i) Write down the value of $\cos68° \cos8° + \sin68° \sin8°$.

   j) Find the value of h so that the equation $2x^2 + hxy - y^2 + 5x + y + 2 = 0$ may represent two straight lines.

SECTION-B

Q2 For what value of λ, does the system $\begin{bmatrix} -1 & 2 & 1 \\ 3 & -1 & 2 \\ 0 & 1 & \lambda \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = 0$ has

a) A unique solution   b) More than one solution.

Q3 Bag A contains 2 white and 3 red balls and Bag B contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from the Bag B.

Q4 The sum of three numbers in G.P. is 21 and their product is 216. Find them.

Q5 Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that all vowels never occur together.

Q6 Find a if the 17th and 18th terms of the expansion $(2+a)^{50}$ are Equal.

SECTION-C

Q7 State and prove Cayley-Hamilton Theorem.

Q8 Find the equation of the circle passing through the points (1, 1), (2, −1), (3, −2).

Q9 Five defective bulbs are accidentally mixed with twenty good ones. It is not possible to just look at a bulb and tell whether or not it is defective. Find the probability distribution of the number of defective bulbs, if four bulbs are drawn at random from this lot.