# B.TECH.
## (SEM II) THEORY EXAMINATION 2017-18
## ELEMENTARY MATHEMATICS-II

*Time: 3 Hours*                                          *Total Marks: 70*

**Note:**  **1.** Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

1.      **Attempt *all* questions in brief.**                        2 x 7 = 14

   a.      Evaluate $(4e^{3x} + 1)$

   b.      Find the order and degree of the differential equation $\left(\dfrac{d^2 y}{dx^2}\right)^4 + \left(\dfrac{dy}{dx}\right)^2 + \left(\dfrac{dy}{dx}\right) = 0$

   c.      Evaluate $\int_0^1 (x^4 + x)dx$

   d.      If a line has direction ratios 1, 2, 3, determine its direction cosines.

   e.      Find magnitude of the vector $\overrightarrow{a} = i + j + k$.

   f.      What do you understand by Probability.

   g.      A die is thrown 6 times. If 'getting an odd number' is a success, what is the probability of at least 5 successes?

## SECTION B

2.      **Attempt any *three* of the following:**                    7 x 3 = 21

   a.      Find an anti derivative of $\int_0^4 (x + e^{2x})dx$

   b.      Find the solution of the differential equation $\dfrac{dy}{dx} = -4yx^2$, given that y =1, when x = 0.

   c.      Show that the points A (-2, 3, 5), B(1, 2, 3) and C(7, 0, -1) are collinear.

   d.      Find the equation of line in vector and in cartesian form that passes through the point with position vector $2\hat{\imath} - \hat{\jmath} + 4\hat{k}$ and in the direction $\hat{\imath} + 2\hat{\jmath} - \hat{k}$.

   e.      If P(A) = 0.8, P(B) = 0.5 and P(B|A) =0.4, find P(A∩B) and P(A|B).

## SECTION C

3.      **Attempt any *one* part of the following:**                  7 x 1 = 7

   (a)      Evaluate $\int_0^1 Sin^{-1}(\frac{2x}{1+x^2})dx$

   (b)      the area of the circle $4x^2 + 4y^2 = 9$ which is interior to the parabola $x^2 = 4y$

4.      **Attempt any *one* part of the following:**                  7 x 1 = 7

   (a)      Obtain the differential equation representing the family of parabola having vertex at the origin and axis along the positive direction of x-axis

   (b)      Verify that  $y = e^{-3x}$ is a solution of the differential equation

$$\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0.$$

**5.**      **Attempt any *one* part of the following:**                 **7 x 1 = 7**

(a)     Find the area of a parallelogram whose adjacent sides are given by the vectors $\vec{a} = 3i + j + 4k$ and $\vec{b} = i - j + k.$

(b)     Find the vector equations of the plane passing through the points A(2, 5, -3), B(-2, -3, 5) and C(5, 3, -3).

**6.**      **Attempt any *one* part of the following:**                 **7 x 1 = 7**

(a)     Find the shortest distance between the lines $\vec{r} = (\hat{i} + 2\hat{j} + \hat{k}) + \lambda(\hat{i} - \hat{j} + \hat{k})$ and $\vec{r} = (2\hat{i} - \hat{j} - \hat{k}) + \mu(2\hat{i} + \hat{j} + 2\hat{k})$ .

(b)     Find the vector equation of the plane which is at a distance of $\frac{6}{\sqrt{29}}$ from the origin and its normal vector from the origin is $2\hat{i} - 3\hat{j} + 4\hat{k}.$

**7.**      **Attempt any *one* part of the following:**                 **7 x 1 = 7**

(a)     A random variable X is specified by the following distribution

| X | 2 | 3 | 4 |
|---|---|---|---|
| P(X) | 0.3 | 0.4 | 0.3 |

Find the variance of the distribution.

(b)     What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these
          (i)     Four cards are of the same suit
          (ii)     Four cards belong to four different suits
          (iii)     Two are red cards and two are black cards
          (iv)     Cards are of the same colour