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B. TECH.

THEORY EXAMINATION (SEM–II) 2016-17

ELEMENTARY MATHEMATICS - II

Time : 3 Hours *Max. Marks : 70*

Note : Be precise in your answer.

SECTION – A

1. Attempt all parts of the following questions: 7 x 2 = 14

(a) Evaluate $\int (x^2+1)\,dx.$

(b) Find the order and degree of the differential equation $x\frac{d^2y}{dx^2}+(\frac{dy}{dx})^2-y\frac{dy}{dx}=0.$

(c) Find unit vector in the direction of the vector $\vec{a}=2i+3j+k.$

(d) If a line has direction ratios 2, -1, -2, determine its direction cosines.

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

(f) $\int_0^1 e^x dx.$

(g) Write formula for equation of line passing through a given point and parallel to a given vector.

SECTION – B

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

(a) Find the area of a triangle having the points A(1, 1, 1), B(1, 2, 3) and C(2, 3, 1) as its vertices.

(b) Find the solution of the differential equation $\frac{dy}{dx}=\frac{1+y^2}{1+x^2}.$

(c) Evaluate $\int_0^1 \frac{\tan^{-1}x}{1+x^2}dx.$

(d) (d) Find the vector equations of the plane passing through the points R(2, 5, -3), S(-2, -3, 5) and T(5, 3, -3).

(e) Show that the vectors $\vec{a}=2i-3j+4k$ and $\vec{b}=-4i+6j-8k$ are collinear.

SECTION – C

3. Attempt any two parts of the following: ($3\frac{1}{2}\times 2=7$)

(a) Evaluate $\int_0^1 (x^{\frac{3}{2}}+e^x+\sin x)dx.$

(b) Evaluate $\int x\log x dx.$

(c) Find the area enclosed by the circle $x^2+y^2=a^2.$

4. Attempt any two parts of the following: ($3\frac{1}{2}\times 2=7$)

(a) Verify that $y=e^{-3x}$ is a solution of the differential equation $\frac{d^2y}{dx^2}+\frac{dy}{dx}-6y=0.$

(b) Find the general solution of the differential equation $\frac{dy}{dx}=\frac{x+1}{2-y}.$

(c) Find the general solution of differential equation $x\frac{dy}{dx} + 2y = 2x^2$

5. Attempt any two parts of the following: $(3\frac{1}{2} \times 2 = 7)$

(a) Find projection of the vector $\vec{a} = 2i + 3j + 2k$ on the vector $\vec{b} = i + 2j + k$.

(b) Find $\vec{a} \times \vec{b}$ if $\vec{a} = 2i + j + 3k$ and $\vec{b} = 3i + 5j - 2k$.

(c) Find angle between the vectors $\vec{a} = i + j - k$ and $\vec{b} = i - j + k$.

6. Attempt any two parts of the following: $(3\frac{1}{2} \times 2 = 7)$

(a) Find the vector equation for the line passing through the points (-1, 0, 2) and (3, 4, 6).

(b) Find the equation of the plane with intercepts 2, 3 and 4 on the x, y and z-axis respectively.

(c) Find the angle between the two planes 2x + y -2z = 5 and 3x – 6y -2z = 7 using vector method.

7. Attempt any two parts of the following: $(3\frac{1}{2} \times 2 = 7)$

(a) If $P(A) = \frac{7}{13}$, $P(B) = \frac{9}{13}$ and $P(A \cap B) = \frac{4}{13}$, evaluate $P(A|B)$ and $P(A \cup B)$.

(b) Ten cards numbered 1 to 10 are placed in a box, mixed up thoroughly and then one card is drawn randomly. If it is known that the number on the drawn card is more than 3, what is the probability that it is an even number?

(c) An unbiased die is thrown twice. Let the event A be 'odd number on the first throw' and B the event 'odd number on the second throw'. Check the independence of the events A and B.