

Subject Code: R10102/R10
Set No - 1
I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015
MATHEMATICS – I

(Common to All Branches)

Time: 3 hours
Max. Marks: 75
Answer any FIVE Questions
All Questions carry equal marks

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1. (a) If 30% of a radioactive substance disappear in 10 days, how long will it take for 90% of it to disappear?
 (b) Solve the D.E $(\cos^3 x)y' + y \cos x = \sin x$ [8+7]
2. (a) Solve the D.E $(D^2-4)y = e^{2x} + \sin 2x$
 (b) Solve the D.E $(D^2-4D+2)y = x^2 e^{2x} + \cos 2x$ [8+7]
3. (a) Verify whether $u = \frac{x+y}{1-xy}$ & $v = \tan^{-1}(x) + \tan^{-1}(y)$ are functionally depended or independent.
 (b) Find Taylor series expansion for $\tan^{-1}(y/x)$ about (1,1) [8+7]
4. (a) Trace the curve $xy^2 = a^2(x-a)$ ($a > 0$)
 (b) Trace the curve $r = a(1 + \cos \theta)$ [8+7]
5. (a) Find the perimeter of the curve $r = a(\cos \theta + \sin \theta)$
 (b) Find the volume of the solid generated by revolution of $x = a \cos^3 \theta$, $y = \sin^3 \theta$ about its x-axis. [8+7]
6. (a) By change of order of integration evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} (x^2 + y^2) dx dy$
 (b) Evaluate $\iiint xyz dx dy dz$ over a positive octant of a sphere with centre zero and radius a. [8+7]
7. (a) Find the directional derivative of $f = x^3 y^2 z$ at (1,2,3) along the direction of $9\vec{i} + 3\vec{j} + \vec{k}$
 (b) Prove that $\text{curl}(\text{curl} f) = \text{grad div} f - \nabla^2 f$ [8+7]
8. Verify Stokes theorem for $f = y^2 \vec{i} + yz \vec{j} - zx \vec{k}$ and S is the upper half of the surface $x^2 + y^2 + z^2 = a^2$ and $z \geq 0$. [15]

Subject Code: R10102/R10
Set No - 2
I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015
MATHEMATICS – I

(Common to All Branches)

Time: 3 hours
Max. Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Solve the D.E $xy^1 - 2y = xy^4$
 (b) Find the orthogonal trajectories of the system of curves $\left(\frac{dy}{dx}\right)^2 = a/x$ [8+7]
2. (a) Solve the D.E $(D^2 + 3D + 2)y = x^2 + e^{-x}$
 (b) Solve the D.E $(D^2 - 4D + 3)y = e^x \cos 2x$ [8+7]
3. (a) Find Taylor series expansion for e^{x+y} about (1,1)
 (b) Discuss the maxima or minima of $\sin x + \sin y + \sin(x+y)$ [8+7]
4. (a) Trace the curve $xy^2 = 4a^2(2a-x)$ ($a > 0$)
 (b) Trace the curve $r = a(1 - \cos \theta)$ [8+7]
5. (a) Find the length of the arc of the curve $x = a(\cos \theta + \theta \sin \theta)$, $y = a(\sin \theta - \theta \cos \theta)$ from $\theta = 0$ to any point on the curve.
 (b) Find the volume of the solid generated by revolution of ellipse about its minor axis. [8+7]
6. (a) By change of order of integration evaluate $\int_0^a \int_0^{\sqrt{a^2 - x^2}} xy dx dy$
 (b) Evaluate $\iiint xy^2 z dx dy dz$ over a positive octant of a sphere with centre zero and radius a . [8+7]
7. (a) Find the directional derivative of $f = x^2 - 2y^2 + z^2$ at (1, -1, 2) along the direction of $i + 3j + 2k$.
 (b) Prove that $\text{grad}(f \cdot g) = f \times \text{curl } g + g \times \text{curl } f + (f \cdot \nabla)g + (g \cdot \nabla)f$ [8+7]
8. Verify Stokes theorem for $f = (x^2 - y^2)i + 2xyj$ and C is the rectangle in the xy -plane bounded by $x = 0$, $x = a$, $y = 0$, $y = b$. [15]

Subject Code: R10102/R10
Set No - 3
I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015
MATHEMATICS – I

(Common to All Branches)

Time: 3 hours
Max. Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Solve the D.E $e^y dx + (xe^y + 2y) dy = 0$.
 (b) If the temperature of air is $20^\circ C$ and the temperature of the body drops from $100^\circ C$ to $80^\circ C$ in 10 minutes. What will be its temperature after 20 minutes. When will be the temperature $40^\circ C$ [8+7]
2. (a) Solve the D.E $(D^2 - 4D + 4)y = e^{2x} + x^3$
 (b) Solve the D.E $(D^2 + 1)y = x \cos x$ [8+7]
3. (a) Find the points on the surface $z^2 = xy + 1$ nearest to origin
 (b) Prove that $J.J^1 = 1$ for $x = u(1-v)$, $y = uv$ [8+7]
4. (a) Trace the curve $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$
 (b) Trace the curve $r = a \sin 2\theta$ [8+7]
5. (a) Find the length of the arc of the curve $y^3 = ax^2$ from $(0,0)$ to $(a/8, a/4)$
 (b) Find the surface of the solid generated $r^2 = a^2 \cos 2\theta$ about the initial line. [8+7]
6. (a) By change of order of integration evaluate $\int_0^1 \int_{x^2}^{2-x} xy dx dy$
 (b) Evaluate $\int_0^e \int_0^{\log y} \int_0^{e^x} \log z dz dx dy$ [8+7]
7. (a) Find the directional derivative of $f = x^3 y^2 z^2 = 4$ at $(-1, -1, 2)$ along the direction of $4i + 3j + 2k$
 (b) Prove that $\text{curl}(\text{grad } \phi) = 0$, where ϕ is a scalar point function [8+7]
8. Verify Green's theorem for $f = (x^2 + y^2)i - 2xyj$ and C is the rectangle in the xy -plane bounded by $x = 0$, $x = a$, $y = 0$, $y = b$. [15]

Subject Code: R10102/R10**Set No - 4****I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015****MATHEMATICS – I****(Common to All Branches)****Time: 3 hours****Max. Marks: 75****Answer any FIVE Questions
All Questions carry equal marks***** * * * ***

1. (a) The number of N of bacteria in a culture grew at a rate proportional to N . The value of N was initially 100 and increased to 332 in one hour. What was the value of N after $3/2$ hours.
(b) Solve the D.E $y(xy+1)dx+x(1-xy)dy=0$ [8+7]
2. (a) Solve the D.E $(D^2-4D+3)y = \sin 3x \cos 2x$
(b) Solve the D.E $(D^2-1)y = x^2 + x \sin x$ [8+7]
3. (a) Find Taylor series expansion for $e^x \cos y$ about $(1, \pi/4)$
(b) Find the minima value of $x^2+y^2+z^2$ given that $ax + by + cz = p$ by Lagrange's method of multipliers. [8+7]
4. (a) Trace the curve $x = a(\theta - \sin \theta)$, $y = a(1 + \cos \theta)$
(b) Trace the curve $r^2 = a^2 \sin 2\theta$ [8+7]
5. (a) Find the length of the arc of the curve $y = \log \sec x$ from $x = 0$ to $x = \pi/3$
(b) Find the surface of the solid generated $r = a(1 + \cos \theta)$ about the initial line. [8+7]
6. (a) By change of order of integration evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy$
(b) Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz dx dy$ [8+7]
7. (a) Find the directional derivative of $f = xy + yz + zx$ at $(1, 2, 3)$ along the direction of $3i + 4j + 5k$
(b) Prove that $\text{div}(\text{curl } f) = 0$ where f is a vector function [8+7]
8. Verify Gauss divergence theorem for $f = yi + xj + z^2k$ for the cylindrical region given by $x^2 + y^2 = a^2$, $z = 0$, $z = h$. [15]
