RAMAIAH

Institute of Technology



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(Autonomous Institute, Affiliated to VTU)

(Approved by AICTE, New Delhi & Govt. of Karnataka)

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MAKE UP EXAMINATIONS – SEPTEMBER 2021

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| **Program** | **:** | B.E. : Common to all Programs | **Semester** | **:** | I |
| **Course Name** | **:** | Engineering Mathematics - I | **Max. Marks** | **:** | **100** |
| **Course Code** | **:** | MA11/MAT101 | **Duration** | **:** | **3 Hrs** |

**Instructions to the Candidates:**

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| * Answer one full question from each unit. |

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|  |  | **UNIT - I** |  |  |
| 1. | a) | State any two properties of Jacobians. | CO1 | (02) |
|  | b) | Show that at any point, the tangent to the curve makes an angle with the initial line. | CO1 | (04) |
|  | c) | If then show that | CO1 | (07) |
|  | d) | If then prove that | CO1 | (07) |
|  |  |  |  |  |
| 2. | a) | Write the expression for length of the perpendicular from pole to the tangent. | CO1 | (02) |
|  | b) | If where then find | CO1 | (04) |
|  | c) | Show that the curves and intersect at an angle . | CO1 | (07) |
|  | d) | If show that and are functionally dependent and find the functional relationship. | CO1 | (07) |
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|  |  | **UNIT - II** |  |  |
| 3. | a) | Define cusp and node. | CO2 | (02) |
|  | b) | Evaluate . | CO2 | (04) |
|  | c) | Find the length of the arc of the parabola cut-off by . | CO2 | (07) |
|  | d) | Find the surface area of the solid generated when the cardioid  is rotated about the initial line. | CO2 | (07) |
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| 4. | a) | Write the expression to find the volume of solid of rotation for cartesian curve when rotated about -axis and –axis. | CO2 | (02) |
|  | b) | Find the area of the cardioid . | CO2 | (04) |
|  | c) | Prove that . | CO2 | (07) |
|  | d) | Trace the curve . | CO2 | (07) |
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|  |  | **UNIT - III** |  |  |
| 5. | a) | If is the position vector of the point , then define unit normal vector. | CO3 | (02) |
|  | b) | Prove that | CO3 | (04) |
|  | c) | If the directional derivative ofat (-1, 1, 2) has a maximum magnitude of 32 units in the direction parallel to -axis, find | CO3 | (07) |
|  | d) | Show thatis irrotational. Also find a scalar function such that. | CO3 | (07) |
|  |  |  |  |  |
| 6. | a) | Define solenoidal vector. | CO3 | (02) |
|  | b) | If , find  at the point (1,-1,1). | CO3 | (04) |
|  | c) | A particle moves along the curve  where *t* is time, find the tangential and normal components of its acceleration at | CO3 | (07) |
|  | d) | Prove that . | CO3 | (07) |
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|  |  | **UNIT - IV** |  |  |
| 7. | a) | Write the relation between cylindrical polar coordinates and cartesian coordinates. | CO4 | (02) |
|  | b) | Write the limits of integration  by changing the order of integration. Draw the region of integration neatly. | CO4 | (04) |
|  | c) | Evaluate by changing to polar coordinates. | CO4 | (07) |
|  | d) | Find the volume of the tetrahedron bounded by the planes  and . | CO4 | (07) |
|  |  |  |  |  |
| 8. | a) | Write the procedure of evaluating double integral by changing into polar coordinates. | CO4 | (02) |
|  | b) | Evaluate by changing the order of integration. | CO4 | (04) |
|  | c) | By using the transformation evaluate  where  is the region bounded by the parallelogram , ,, and . | CO4 | (07) |
|  | d) | Evaluate . | CO4 | (07) |
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|  |  | **UNIT -V** |  |  |
| 9. | a) | State Green’s theorem in a plane. | CO5 | (02) |
|  | b) | Evaluate along the parabola from . | CO5 | (04) |
|  | c) | Using Stoke’s theorem evaluate for  where  is the cubical surface formed by the planes . | CO5 | (07) |
|  | d) | If , then evaluate where  is the volume of the region bounded by the surface  . | CO5 | (07) |
|  |  |  |  |  |
| 10. | a) | State Stoke’s theorem. | CO5 | (02) |
|  | b) | Evaluate where  is the surface of the sphere using Gauss - Divergence theorem. | CO5 | (04) |
|  | c) | Verify Green’s theorem in plane for where  is the boundary of the region defined by and . | CO5 | (07) |
|  | d) | Verify Stoke’s theorem for the vector taken round the rectangle bounded by the lines . | CO5 | (07) |
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