**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech I Year II Semester Examinations, November/December - 2020**
**MATHEMATICS-II**
**(Common to EEE, ECE, CSE, EIE, IT, ETM)**

**Time: 2 hours**                                                         **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**
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1.  Using Laplace transforms solve y" – 2y' + y = e$^t$ with y = 2, $\frac{dy}{dt}$ = -1 at t = 0.    [15]

2.a)  Find $L\left[\frac{1-\cos t}{t}\right]$

  b)  Find $L^{-1}\left[\frac{s}{(s+1)^2(s^2+1)}\right]$                                          [7+8]

3.a)  Evaluate $\int\limits_{0}^{\infty} x^6 e^{-2x} dx$.

  b)  Prove that $\int\limits_{0}^{1}\frac{x^2 dx}{\sqrt{1-x^4}} \times \int\limits_{0}^{1}\frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{4\sqrt{2}}$.    [7+8]

4.a)  Evaluate $\int\limits_{0}^{\frac{\pi}{2}} \sin^5 \theta \cos^{\frac{7}{2}} d\theta$.

  b)  Evaluate $\int\limits_{0}^{1} x^7(1-x^5)^{11} dx$.                                          [7+8]

5.a)  Calculate $\iint r^3$ drdθ over the area included between the circles r = 2sinθ and r = 4sinθ.

  b)  Change the order of integration and then evaluate $\int\limits_{-2}^{1}\int\limits_{x^2+4x}^{3x+2} dydx$.    [7+8]

6.  Find the volume bounded by the paraboloid x$^2$ + y$^2$ = az, the cylinder x$^2$ + y$^2$ = 2ay and the plane z = 0 (a>0).    [15]

7.a)  Evaluate i) $\nabla.(3x^2 i + 5xy^2 j + xyz^3 k)$ and ii) $\nabla \times [(xyz)i + (3x^2 y)j + (xz^2 - y^2 z)k]$ at the point (1,2,3).

  b)  Find the directional derivative of the function $\phi = x^2 yz + 4xz^2$ at (1,–2,–1) in the direction of $2\bar{i} - \bar{j} - \bar{k}$.    [8+7]

8.  Verify Divergence theorem for $\overline{F} = (x^2 - yz)$ i+(y$^2$ – zx) j+(z$^2$ – xy)k, taken over the rectangular parallelepiped 0 ≤ x ≤ a, 0 ≤ y ≤ b, 0 ≤ z ≤ c.    [15]

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