1662

Reg. No.:....

Name:.....

Combined First and Second Semester B.Tech. Degree Examination, April 2013 (2008 Scheme)

08-101 : ENGINEERING MATHEMATICS - I

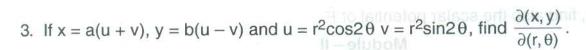
Time: 3 Hours

Max. Marks: 100

PART-A

Answer all questions. Each question carries 4 marks.

- 1. Find the n^{th} derivative of $e^{x}(2x + 3)^{3}$
- 2. Expand $\sin\left(\frac{\pi}{4} + x\right)$ in powers of x



- 4. If $\vec{r} = xi + yj + zk$ and $\vec{r} = |\vec{r}|$, then show that $\Delta(\vec{a}.\vec{r}) = \vec{a}$ where \vec{a} is a constant vector.
- 5. Solve $(D^2 + 2D + 1)y = x^3$

$$-6. \text{ Find L}\left(\frac{e^{-at}-e^{-bt}}{t}\right)$$

- 7. Find the orthogonal trajectories of hyperbolas xy = c
- 8. Find the rank of the matrix

nave a solution and solve them in each case.
Obtain an ontagonal transformation which will transform the
$$c_{-3}$$
 c_{-3} $c_{$

- 9. Show that the vectors (1, 2, -1, 3) (2, -1, 3, 2) and (-1, 8, -9, 5) are linearly dependent and find a relation connecting them.
- 10. Show that the eigen values of a triangular matrix are its diagonal elements.

PART-B

Answertwo questions from each module.

Module - I

11. Show that the evolute of the ellipse
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$
 is $(ax)^{\frac{2}{3}} + (by)^{\frac{2}{3}} = (a^2 - b^2)^{\frac{2}{3}}$

12. If
$$u = \sin^{-1} \left(\frac{x + y}{\sqrt{x} + \sqrt{y}} \right)$$
, prove that

i)
$$xu_x + yu_y = \frac{1}{2} \tan u$$

ii)
$$x^2 u_{xx} + 2xy u_{xy} + y^2 u_{yy} = -\frac{\sin u \cos^2 u}{4 \cos^3 u}$$

13. Find the values of the constants a, b, c, so that $\vec{F} = (axy + bz^3)\hat{i} + (3x^2 - cz)\hat{j} + (3xz^2 - y)\hat{k} \text{ may be irrotational. For these values of a, b, c, find also the scalar potential of } \vec{F} \,.$

Module - II

14. Solve
$$\frac{dx}{dt} + 5x - 2y = t$$
, $\frac{dy}{dt} + 2x + y = 0$

- 15. Using method of variation of parameters, solve $(D^2 + 2D + 1)y = e^{-x} \log x$
- 16. Using Laplace transform, solve

$$\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = 4 \text{ given } y(0) = 2, \ y'(0) = 3$$

Module - III

- 17. For what values of K, the equations x + y + z = 1, 2x + y + 4z = K, $4x + y + 10z = K^2$ have a solution and solve them in each case.
- 18. Obtain an orthogonal transformation which will transform the quadratic form 6x² + 3y² + 3z² - 4xy - 2yz + 4zx into sum of squares and find the reduced form. Examine for definiteness.

19. Given
$$A = \begin{bmatrix} 1 & 0 & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{bmatrix}$$
. Find A^{-1} and A^{4} using Cayley – Hamilton theorem.