A (Printed Pages 4)

(20222) Roll No. ....

B.Sc.(Com.Sci.)-I Sem.

NP-3573(CV-III)

B.Sc. (Computer Science)

Examination, Dec.-2021

APPLIED MATHEMATICS - I

(BCS-102)

Time : 1½ Hours] [Maximum Marks : 75

Note : Attempt questions from all Sections as per instructions.

Section-A

(Very Short Answer Questions)

Note : Attempt any **two** questions. Each question carries 7.5 marks. 2×7.5=15

1. Find the differential coefficient of $e^{2x} \sin^3 x$.

2. Find the Jacobian J(u, v) for

$u=e^x \sin y,\ v=x \log \sin y$.

3. Find the inverse of the matrix by elementary transformation.

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$$

4. Find $\iint_R f(x, y)\, dA$ for $f(x,y)=1-6x^2y$ and R.I. $0 \le x \le 2,\ -1 \le y \le 1$.

5. Find the magnitude of the gradient of the function $f=xyz^3$ at (1,0,2).

Section-B

(Short Answer Questions)

Note : Attempt any **one** question. Each question carries 15 marks. 1×15=15

6. $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$ show that

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$$

7. Prove that $x^5-5x^4+5x^3-10$ has a maximum for x=1, a minimum for x=3 and for x=0, it has neither a maximum

nor a minimum.

8. Reduce the matrix A to canonical form

and find its rank:

$$A = \begin{bmatrix} 2 & -1 & 3 & 3 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 4 \\ 2 & 5 & 11 & 5 \end{bmatrix}$$

Section-C

(Detailed Answer Questions)

Note : Attempt any **two** questions. Each question carries 22.5 marks.

2×22.5=45

9. (a) Find Taylor's Series expansion of $f(xy)=x^3+xy^2$ about point (2, 1).

   (b) Expand log (1+x) in powers of x.

10. Use the method of Lagrange's multipliers to find the volume of the largest rectangular parallelepiped that can be inscribed in the ellipsoid

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$$

11. State Cayley-Hamiltan theorem. Find the eigen. Values and eigen vectors of the matrix

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

12. (a) By changing the order of integration Evaluate $\int_0^1 \int_{x^2}^{2-x} xy\, dy\, dx$

    (b) Define Beta and Gamma function. Establish the relation between Beta and Gamma function

$$\beta(m,n) = \frac{\Gamma m \, \Gamma n}{\Gamma(m+n)}$$

13. (a) Define curl of a vector. Prove the following vector identify:

$$\text{div } (\vec{u}\times\vec{v}) = \vec{v}.\text{curl}\,\vec{u} - \vec{u}.\text{curl}\,\vec{v}$$

    (b) State Gauss divergence theorem. Use Gauss divergence theorem in Cartesian form to evaluate

$$\iint x\,dy\,dz + y\,dz\,dx + z\,dx\,dy,$$

where the surface S is the sphere $x^2+y^2+z^2=a^2$.

https://www.ccsustudy.com