Enroll. No. ______________

SILVER OAK COLLEGE OF ENGINEERING & TECHNOLOGY

ADITYA SILVER OAK INSTITUTE OF TECHNOLOGY

BE - SEMESTER–I • MID SEMESTER-I EXAMINATION – WINTER 2018

SUBJECT: MATHS-I (3110014) (ALL BRANCH)

DATE: 03-10-2018 TIME:02:00 pm to 03:45 pm TOTAL MARKS:40

Instructions: 1.Q. 1 is compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if required.

Q.1 (a) Give Answer with most suitable/correct option. [05]

(i) The value of $\lim_{x\to\pi}\frac{\sin x}{\pi - x}$ is _____
(a) 0 (b) 1 (c) π (d) -1

(ii) If A= $\begin{bmatrix}1 & 2\\ 2 & 4\end{bmatrix}$ then rank of matrix A is
(a) 0 (b) 1 (c) 2 (d) None of these

(iii) A stionary point (a,b) is said to be a Saddle point if at (a,b) _____
(a) $rt-s^2>0$ (b) $rt-s^2<0$ (c) $rt-s^2=0$ (d) $rt-s^2\geq 0$

(iv) If Ø=xyz, then the value of |∇ Ø| at point (1,2,-1) is
(a) 0 (b) 1 (c) 2 (d) 3

(v) Let A = $\begin{bmatrix}1 & 2\\ 0 & 3\end{bmatrix}$ then the Eigen values of A^2 are
(a) 1,3 (b) 0,2 (c) 1,9 (d)0,4

(b) Solve the following system using Gauss-Jordan method: [05]

$$x_1+x_2+2x_3-5x_4=3$$
$$2x_1+5x_2-x_3-9x_4=-3$$
$$2x_1+x_2-x_3+3x_4=-11$$
$$x_1-3x_2+2x_3+7x_4=-5$$

Q.2 (a)

(1) Evaluate $\lim_{x\to 0}\left[\frac{1}{x^2}-\frac{1}{\sin^2 x}\right]$ [03]

(2) Find the equations of the Tangent plane and Normal line to the surface $2xz^2-3xy-4x=7$ at (1, -1, 2). [03]

(b) Find the Eigen values and Eigen vectors of the matrix [05]

A= $\begin{bmatrix}3 & 1 & 4\\ 0 & 2 & 6\\ 0 & 0 & 5\end{bmatrix}\begin{bmatrix}3 & 1 & 4\\ 0 & 2 & 6\\ 0 & 0 & 5\end{bmatrix}$

(c) Find the inverse of matrix $A=\begin{bmatrix}2 & 3 & 4\\ 4 & 3 & 1\\ 1 & 2 & 4\end{bmatrix}$ using Gauss Jordan Method. [04]

OR

Q.2 **(a)** **(1)** Find $\lim_{x \to 0} \left(\frac{a^x + b^x + c^x}{3} \right)^{\frac{1}{3x}}$ [03]

(2) If $u = f(x - y, y - z, z - x)$ $u = f(x - y, y - z, z - x)$, then Show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$ [03]

(b) For which value of and μ the following system have (i) no solution (ii) unique solution (iii) an infinite no. of solution [05]

$x + y + z = 6,$

$x + 2y + 3z = 10, x + 2y + \lambda z = \mu$

(c) Find the numbers $x, y \wedge z$ such that $xy + yz + zx$ $\mathbf{xyz = 8 \; \& \; xy + yz + zx}$ is maximum subject to constrain $xyz = 8$using the Lagrange's method of undetermined multipliers. [04]

Q.3 **(a)**

(1) Solve the following system by Gaussian elimination: [03]

$x + y + z = 6$,

$x + 2y + 3z = 14$,

$2x + 4y + 7z = 30$.

(2) Find the directional derivative of the function $\phi = 4xz^3 - 3x^2 y^2 z$ at the point $(2, -1, 2)$ in the direction of $2\hat{i} + 3\hat{j} + 6\hat{k}$. [03]

(b) Find the Extreme values of the function $x^3 + 3xy^2 - 3x^2 - 3y^2 + 7$. [05]

(c) If $u = r^m$, prove that $u_{xx} + u_{yy} + u_{zz} = m(m+1) r^{m-2}$, where $r^2 = x^2 + y^2 + z^2$. [04]

OR

Q.3 **(a)** **(1)** By considering different paths of approach, show that the function [03]

$f(x, y) = \frac{x^4 - y^2}{x^4 + y^2}$ has no limit as $(x,y) \to (0,0)$

(2) Using partial differentiation find $\frac{dy}{dx}$ $\frac{dy}{dx}$ for $\cos x^y = x^{\sin y}$ [03]

(b) If $u = \tan^{-1}\left(\frac{y}{x}\right)$, then show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$ [05]

(c) Convert the following matrix in to Reduced Row Echelon form and hence find the Rank of a matrix. [04]

$$A = \begin{bmatrix} 1 & 3 & 2 & 2 \\ 1 & 2 & 1 & 3 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 8 \end{bmatrix}.$$

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