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Total No. of Pages: 03
Total No. of Questions: 09

B. Tech. (Sem.-2nd)

ENGINEERING MATHEMATICS-II

Subject Code: AM-102
Paper ID: [A0119]

Time: 3 Hrs. **Max. Marks: 60**

INSTRUCTIONS TO CANDIDATE:

1. ***Section –A, is Compulsory.***
2. ***Attempt Five questions from section B and section C with at least two questions each from section B and Sections C.***

Section –A

(10x2=20)

Q.1.

(a) Show that the vectors x_1= (1, 2, 4), x_2= (2,-1, 3), x_3= (0, 1, 2) and x_4= (-3, 7, 2) are linearly dependent, and find the relation between them.

(b) Solve $\sec^2 x \tan y\, dx + \sec^2 y \tan x\, dy = 0$.

(c) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = sin3x$.

(d) Prove that $\nabla^2(r^m) = m(m+1)r^{m-2}$.

(e) If $\vec{A} = (3xz^2)\hat{\imath} - (yz)\hat{\jmath} + (x+2z)\hat{k}$ find curl (curl $\vec{A}$)

(f) State any five characterstics of Normal curve

(g) State Green's theorem in the plane.

(h) A die is thrown 10 times. If getting an even number is a success. What is the probability of getting at least 6 successes.

(i) Fit a straight line to the following data considering y as the dependent variable.

x	1	2	3	4	5
y	5	7	9	10	11

(j) Define types of errors in testing of hypothesis.

Section –B

Q.2. (a)Find the Eigen values and the corresponding Eigen vectors of the matrix

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

(b) Reduce the following quadratic form to sum of squares by linear transformations:

$10x^2 + y^2 + z^2 - 6xy - 2yz + 6zx.$ 4

Q.3. (a) Solve $(xy^2 - 2x^2y^3)\,dx + (x^2y - x^3y^2)\,dy = 0$ 4

(b) Solve the equation:

$16x^2y + 2p^2y - p^3x = 0$, Where $p = \frac{dy}{dx}$. 4

Q.4. (a) Use method of variation of parameters to solve the following differential equation:

$y'' + 4y = 4\sec^2 2x$.. 4

(b) Obtain the complete solution of the differential equation:

$x^3 \frac{d^3y}{dx^3} - 2x^2 \frac{d^2y}{dx^2} + 2y = 10\left(x + \frac{1}{x}\right).$ 4

Q.5. (a) Show that the frequency of free vibrations in a closed electrical circuit with inductance L & capacity C in series is $\frac{30}{\pi\sqrt{LC}}$ per minute. 4

(b)A particle executing S.H.M has amplitude ‘a’. Show that the distance of the point from the center at which the velocity is half of the maximum velocity is $\frac{\sqrt{3}a}{2}$ 4

Section –C

Q.6. (a) A fluid motion is given by $\vec{V} = (y+z)\hat{\imath} - (Z+x)\hat{\jmath} + (x+y)\hat{k}$ Is this motion irrotational. If so, find velocity potential. 4

(b) Show that $\iint_S \vec{F}.\hat{n}\, dS = 3/2$, where $\vec{F} = (4xz)\hat{\imath} - (y^2)\hat{\jmath} + (yz)\hat{k}$ & S is the surface of the cube bounded by the planes $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$ 4

Q.7. (a) Verify Stoke's theorem for the vector field $\vec{F} = y\hat{\imath} - z\hat{\jmath} + x\hat{k}$, where S is the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$ and C is its boundary. 4

(b)Use divergence theorem to evaluate $\iint_S \vec{F}.\hat{n}\, dS$, where $\vec{F} = x^3\hat{\imath} + (x^2y)\hat{\jmath} + (x^2z)\hat{k}$ & S is the surface bounding the region $x^2 + y^2 = a^2, z = 0, z = b$. 4

Q.8. (a) Obtain Poisson distribution as a limiting case of binomial distribution. 4

(b)In a Normal distribution 7% of the items are under 35 & 89% are under 63. What are the mean and standard deviation of the distribution. 4

Q.9. (a) In one sample of 8 observation, the sum of the squares of the deviations of the sample values from the sample mean was 84.4 & in another sample of 10 observations. It was 102.6. Test whether the two samples have been drawn from two normal population with the same variance (F for 7 & 9 d.f at 5% level of significance=3.29) 4

(b)The heights of 10 males of a given locality are found to be

70,67,62,68,61,68,70,64,64,66 inches. Is it reasonable to believe that the average height is greater than 64 inches. Given the tabulated value of t for 9 d.f at 5% level of significance for single tail test is 1.83 4

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