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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS) III-Semester Backlog (Old) Examinations, December-2018

Engineering Mathematics-III

Time: 3 hours Max. Marks: 70

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** questions from **Part-B***

Part-A (10 × 2=20 Marks)

1. State the conditions under which a given function can be expanded in Fourier series.
2. Find the value of a_0 in the Fourier expansion of the function $f(x) = \begin{cases} 1+t, -1 \le t \le 0 \\ 1-t \ ,0 \le t \le 1 \end{cases}$
3. Deduce the Partial differential equation by elimination of the arbitrary constants $a\ and\ b$ from the equation $z = axe^y + \frac{1}{2}\ a^2e^{2y} + b$
4. Explore the solution of the partial differential equation $p - q = \frac{z}{x+y}$
5. Establish the relation between the operators $(i)\ \Delta\ and\ E\ \ (ii)\ \nabla\ and\ E^{-1}$
6. By choosing an appropriate Interpolation formula, construct a second degree polynomial for the following data: (1,3),(2,5),(3,10).
7. Write any four properties of the Normal Distribution.
8. Prove that $E(X+Y) = E(X) + E(Y)$
9. The equations of two regression lines obtained in a correlation analysis are $3x + 2y = 26\ and\ 6x + y = 31. Find\ (i)\ the\ correlation\ coefficient\ r, and$ $(ii)\ The\ mean\ values\ of\ x\ and\ y$
10. Show that the limits of correlation coefficient r are $-1 \le r \le +1$

Part-B (5 × 10=50 Marks)

11. a) Expand the function $f(x) = \left(\frac{\pi - x}{2}\right)^2 \quad in\ 0 \le x \le 2\pi$ [5]

b) Find the half range sine and cosine series of $f(x) = x\ , in\ 0 < x < 2$ [5]

12. a) Solve the differential equation $z^2(p^2z^2 + q^2) = 1$ [4]

b) Solve the partial differential equation $\frac{\partial u}{\partial t} = \alpha^2\frac{\partial^2 u}{\partial x^2}$ for the conduction of heat along the rod without radiation, subject to the following conductions [6]

$(i) u\ is\ not\ infinite\ for\ t \to \infty \quad (ii)\ \frac{\partial u}{\partial x} = 0\ for\ x = 0\ and\ x = l$

$(iii) u(x, 0) = lx - x^2\ for\ t = 0, between\ x = 0\ \&\ x = l$

13. a) A body is moving with velocity v at any given time t and satisfies the following data [5]

t	0	1	3	4
v	21	15	12	10

Obtain the distance travelled in 4 seconds and acceleration at the end of 4 seconds.

b) Obtain the approximate value of y at $x = 1$ *in steps of* 0.2 by Euler's method given [5]

$$\frac{dy}{dx} = xy \text{ and } y(0) = 2,$$

14. a) If the $p.d.f.\ \ f(x) = k(x+3)$ *in* $(2,8)$, *determine the value of* k *and* [5]
$(i) P(3 < x < 5)$, $(ii)\ P(x \geq 4)$

b) Derive the mean and Variance of Normal distribution. [5]

15. a) If θ is the angle between the two regression lines in the case of two variables x *and* y, [5]
Show that $tan\theta = \left(\frac{1-r^2}{r}\right)\frac{\sigma_x\sigma_y}{\sigma^2{}_x+\sigma^2{}_y}$, and interpret the result for different values of θ.

b) Calculate the coefficient of correlation and obtain the least square regression lines for the following data: [5]

x	1	2	3	4	5
y	2	5	3	8	7

16. a) Find the Fourier series for the function $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2-x, & 1 < x < 2 \end{cases}$ [5]

b) Solve the partial differential equation $2(z + xp + yq) = yp^2$ by Charpit's method. [5]

17. Answer any *two* of the following:

a) Determine $y'(0)$ *and* $y''(0)$ for the following data: [5]

x	0	1	2	3	4	5
y	4	8	15	7	6	2

b) The marks X obtained in mathematics by 1000 students is normally distributed with mean 78% and standard deviation 11%. Determine (i) How many students got marks above 90% ? (ii) What was the highest mark obtained by the lowest 10% of students? [5]

c) The following table gives the number of aircraft accidents that occurred during the various days of the week. Find whether the accidents are uniformly distributed over the week. [5]

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents	14	16	8	12	11	9	14

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