

FACULTY OF ENGINEERING**B.E. (ECE/M/P/AE)(AICTE) III-Semester (Suppl.) Examination, December 2020****Subject : Mathematics – III****Time : 2 Hours****Max. Marks: 70****PART – A****Note: Answer any five questions.****(5 x 2 = 10 Marks)**

- 1 Obtain a partial differential equation that governs the family of surfaces $z = (x - \alpha)^2 + (y - \beta)^2$.
- 2 Find the general solution of partial differential equation $x y^2 p + y^3 q = (z x y^2 - 4 x^3)$.
- 3 Classify the following partial differential equations
 (a) $\frac{\partial^2 u}{\partial x^2} = 5 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial x}$, (b) $\frac{\partial^2 u}{\partial x^2} + 3 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$
- 4 Classify two dimensional wave and Laplace equations.
- 5 Find the variance of binomial distribution.
- 6 Find the recurrence formula for the moments of Poisson distribution.
- 7 Write the normal equation for $y = a^{bx}$.
- 8 State central limit theorem.
- 9 Two sample of 9 and 7 individuals have variances 4.8 and 9.6 respectively. Is the variance 9.6 significantly greater than the variance 4.6?
- 10 Define Chi-square test.

PART – B**Note: Answer any four questions.****(4 x 15 = 60 Marks)**

- 11 (a) Obtain a second order partial differential equation by elimination the arbitrary functions from $u = f(x + ct) + g(x - ct)$.
 (b) Using a transformation, reduce the partial differential equation $y + 2zq = q(4xp + yq)$ to Clairaut's form and hence find its complete integral.
- 12 (a) Find the general solution of partial differential equation $2xzp + 2yzq = z^2 - x^2 - y^2$.
 (b) Find the equation of the surface which cuts orthogonally the system of surfaces $2xz + 3yz = a(z+2)$, where a is an arbitrary constant and passes through the circle $z = 0, x^2 + y^2 = 9$.
- 13 (a) A thin rod of length l has initial temperature equal to a constant T . The right end of the rod, $x = l$, is insulated while the left end of the rod is kept at zero temperature. Find the temperature distribution in the bar.
 (b) Find the temperature distribution in a thin, infinite bar if the initial temperature is given by

$$u(x, 0) = f(x) = \begin{cases} T_0, & \text{cons tan } t, |x| < 2 \\ 0, & |x| > 2 \end{cases}$$

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- 14 (a) The first four moments about the working mean 28.5 of a distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about the mean. Also evaluate β_1 , β_2 and comment upon the skewness and kurtosis of the distribution.

(b) Find the recurrence formula for the moments of binomial distribution.

- 15 (a) A random variable X has the following probability function :

x	0	1	2	3	4	5	6	7
f	0	k	2k	2k	3k	k ²	2k ²	7k ² +k

- (i) Find the value of k (ii) Evaluate $P(X < 6)$, $P(X \geq 6)$ (iii) $P(0 < X < 5)$.
- (b) In a test on 2000 electric bulbs, it was found that the life of particular make, was normally distributed with an average life of 2040 hours and S.D. of 60 hours. Estimate the number of bulbs likely to burn for
- (i) More than 2150 hours
 (ii) less than 1950 hours
 (iii) more than 1920 hours and but less than 2160 hours
- 16 (a) Three judges, A, B, C give the following ranks. Find which pair of judges has common approach.

A	1	6	5	10	3	2	4	9	7	8
B	3	5	8	4	7	10	2	1	6	9
C	6	4	9	8	1	2	3	10	5	7

- (b) The train resistance R (lbs/ton) is measured for the following values of the velocity V (km/hr).
- 17 (a) Eleven school boys were given a test in drawing. They were given a month's further tuition and a second test of equal difficulty was held at the end of it. Do the marks give evidence that the students have benefitted by extra coaching?

Boys	1	2	3	4	5	6	7	8	9	10	11
Marks I test	23	20	19	21	18	20	18	17	23	16	19
Marks II test	24	19	22	18	20	22	20	20	23	20	17

- (b) Test run with 6 models of an experimental engine showed that they operated for 24, 28, 21, 23, 32 and 22 minutes with a gallon of fuel. If the probability of a Type I error is at the most 0.01, is this evidence against a hypothesis that on the average this kind of engine will operate for atleast 29 minutes per gallon of the same fuel. Assume normality.
