BTS – V – 11.14 – 0841 Reg. No. [| | | | | | | |]

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B.Tech. Degree V Semester Examination November 2014

IT/CS/CE/SE/ME/EE/EC/EB/EI/FT 1501 ENGINEERING MATHEMATICS IV

(2012 Scheme)

Time: 3 Hours Maximum Marks: 100

PART A
(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) A random variable X has a uniform distribution over $(-3,3)$, find k for which $P(X > k) = \frac{1}{3}$. Also evaluate $P(X < 2)$.

(b) Find the mean and standard deviation of the total number of heads occurring in three tosses of an unbiased coin.

(c) A random sample of size 16 has mean 53. The sum of the squares of the deviations taken from the mean is 150. Obtain 99% confidence limits of the population mean.

(d) A random sample of size 18 is taken from a normal population with mean 20 and variance 64. Find the probability that the sample variance s^2 will be less than the population variance.

(e) Prove that $E = e^{hD}$ and hence show that

$$D = \frac{1}{h}\left(\Delta - \frac{1}{2}\Delta^2 + \frac{1}{3}\Delta^3 - \ldots\right)$$

(f) Express $y = 2x^3 - 3x^2 + 3x - 10$ in factorial notation by taking h = 1 and hence find the value of $\Delta^3 y$.

(g) Using Taylor's series method solve $\frac{dy}{dx} = 2y + 3e^x,\ y(0) = 0$ at $x = 0.2$

(h) Solve $\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1$ in the range $0 < x < 0.2$ by using modified Euler's method.

PART B

$(4 \times 15 = 60)$

II. (a) In a certain factory turning out optical lenses, there is a small chance of 1/500 for any one of the lenses to be defective. The lenses are supplied in a packet of 10. Calculate the approximate number of packets containing (i) no defective (ii) one defective (iii) more than two defective in a consignment of 20000 packets. (7)

(b) Fit a curve of the form $y = ab^x$ for the following data: (8)

X :	1	2	3	4	5
Y :	1.6	4.5	13.8	40.2	125

OR

III. (a) The income distribution of workers in a certain factory was found to be normal with mean ₹1000 and standard deviation ₹100. There were 180 persons getting above ₹1200. How many persons were there in all? (7)

(b) Find regression lines from the following values of x and y and hence find the correlation coefficient (8)

X :	1	2	3	4	5
Y :	2	5	3	8	7

IV. (a) A random sample of size of 1000 of school children from rural areas shows the average height 150cm with a standard deviation 45.2cm. A similar sample of 800 students from urban schools has average height 146cm with a standard deviation of 37.3cm. Can you conclude that students of rural areas are taller than students in urban area? $(\alpha = 0.05)$ (7)

(b) A population follows normal distribution with mean μ and variance 9. To test $H_0 : \mu = 5$ against $\mu > 7$, the test procedure suggested to reject H_0 if $\bar{x} \geq 6$ where $\bar{x}$ is the mean of a sample of size 16. Find the significance level and power of the test. (8)

OR

V. (a) Two samples of sizes 9 and 8 gave the variances 17.778 and 11.375. Test whether these samples are drawn from the same normal population $(\alpha = 0.05)$. (7)

(b) A sample of 400 individuals is found to have a mean weight of 67.47kg. Can it be reasonably regarded as a sample from a large population with mean weight 67.39kg and standard deviation 1.3kg? Also find 99% confidence limits. (8)

VI. (a) Estimate $\sqrt{1.12}$ using Stirling's formula from the following table. (7)

X :	1	1.05	1.10	1.15	1.20	1.25
f(x) :	1	1.02470	1.04881	1.07238	1.09544	1.11803

(b) Evaluate $\int_0^1 \frac{dx}{x+1}$ by using (i) Simpson's 1/3rd rule (ii) Gaussian three point formula. (8)

OR

VII. (a) A rod is rotating in a plane. The following table gives the angle θ (in radians) through which the rod has turned for various values of time t (seconds). Calculate the angular velocity and angular acceleration of the rod at t = 0.2 seconds. (7)

T :	0	0.2	0.4	0.6	0.8	1
θ :	0	0.12	0.49	1.12	2.02	3.2

(b) Given the following values (8)

X :	5	7	11	13	17
f(x) :	150	392	1452	2366	5202

Find f(9) using Newton's divided difference formula

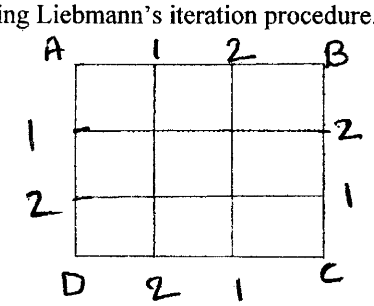
VIII. (a) Given $u_t = u_{xx}, u(0,t) = 0, u(5,t) = 0, u(x,0) = x^2(25 - x^2)$, find u in the range taking h = 1 and up to t = 2 seconds. (7)

(b) Solve $\frac{dy}{dx} = x + z, \frac{dz}{dx} = x - y$ given $y(0) = 0, z(0) = 1$ *for* $x = 0.1$ by using Runge-Kutta method. (8)

OR

IX. (a) Solve $u_{tt} = 4U_{xx}$ with boundary conditions u (0,t) = 0, u (4,t) = 0, u(x,0) = x(4-x), $U_t(x,0) = 0$ for one half period of vibration. (7)

(b) Solve $u_{xx} + U_{yy} = 0$ by using Liebmann's iteration procedure. (8)



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