SE - ME Sem IV 15/5/15

Ps. 1/2

Am-IV

(OLD COURSE) **QP Code : 3978**

(3 Hours) **Total Marks: 100**

N.B. (1) Question No.1 is compulsory.
(2) Attempt any four questions out of the remaining six questions.
(3) Figures to right indicate full marks.

Q1. (a) Find the Fourier series for $f(x)=|x|$ in $(-2, 2)$ 5

(b) Find the probability distribution of number of heads (x) obtained when a fair coin is tossed 4 times. Hence find mean of the distribution. 5

(c) A company supplies tooth-paste in a packing of 100 gm. A sample of 10 packing gave the following weights in gms 100.5, 100.3, 100.1, 99.8, 99.7, 99.7, 100.3, 100.4, 99.2, 99.3 Does the sample support the claim of the company that the packing weights 100 gms. 5

(d) Derive wave equation for Vibration of string. 5

Q2. (a) A continuous random variable x has the probability density function given by 6

$$f(x)=2ax+b \quad 0\le x\le 2$$
$$=0, \quad \textit{otherwise}$$

If the mean of the distribution is 3, find the constants a & b.

(b) Find the Fourier expansion for $f(x)=x$ in $(0, 2\pi)$ 6

(c) Five dice are thrown together 96 times. The number of times 4, 5 or 6 was obtained is given below. 8

No. of times 4, 5 or 6 was obtained:	0	1	2	3	4	5
Freq:	1	10	24	35	18	8

Fit a Binomial distribution.

Q3. (a) Obtain Fourier series for 6

$$f(x)=x+\frac{\pi}{2}, \quad -\pi<x<0$$
$$=\frac{\pi}{2}-x, \quad 0<x<\pi$$

(b) Calculate the Correlation coefficient from the following data. 6

x:	23	27	28	29	30	31	33	35	36	39
y:	18	22	23	24	25	26	28	29	30	32

(c) For the following data 8

x:	1	2	3	4	5	6	7	8	9
y:	9	8	10	12	11	13	14	16	15

Find the lines of regression. Find y for x=6.2

Q4. (a) The probability that a bomb will hit the target is 0.2. two bombs are required to destroy the target. If six bombs are used, find the probability that the target will be destroyed. 6

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(b) Obtain half-range sine series for 6

$$f(x)=x, \quad 0<x<1$$
$$=2-x, \quad 1<x<2$$

(c) Calculate Rank correlation coefficient for the following data: 8

x:	12	17	22	27	32
y:	113	119	117	115	121

Q5. (a) Obtain Fourier series for $f(x)=2x-x^2, 0\le x\le 3$ 6

(b) Fit a Poisson distribution to the following data 6

x :	0	1	2	3	4	Total
f :	192	100	24	3	1	320

(c) Solve the one dimensional wave equation $\frac{\partial^2 u}{\partial t^2}=a^2\frac{\partial^2 u}{\partial x^2}$ under the condition 8

$u=0$ *when* $x=0$ & $x=\pi$,

$\frac{\partial u}{\partial t}=0$ *when* $t=0$ & $u(x,0)=x, \quad 0<x<\pi$

Q6. (a) Obtain complex form of Fourier series for $f(x)=e^{ax}$ in $(-\pi,\pi)$. 6

(b) Of a large group of men 5% are under 60 inches in height and 40% are between 60 & 65 inches in height. Assuming the distribution to be normal find the Mean & Variance. 6

(c) Fit a second degree curve to the following data and estimate the value of y when x=80. 8

x :	10	20	30	40	50	60	70
yI :	20	60	70	80	90	100	100

Q7. (a) Justify, if there is any relationship between sex and color for the following data. 6

Color	Male	female
Red	10	40
White	70	30
Green	30	20

(b) A machine is claimed to produce nails of mean length 5 cm & S.D. of 0.45 cm. A random sample of 100 nails gave 5.1 cm as their average length. Does the performance of the machine justify the claim? Mention the LOS you use. 6

(c) A rod of length 'l' with insulated sides is initially at a uniform temperature u_0. Its ends are suddenly cooled to 0^0C and are kept at that temperature. Find the temperature function. 8