[KY 012]   **Sub. Code: 4012**

M.Sc (MEDICAL PHYSICS) DEGREE EXAMINATION

(Revised Regulations for Candidates admitted from 2010-2011)

FIRST YEAR

Paper II – RADIOLOGICAL MATHEMATICS

Q.P. Code : 284012

Time : Three hours   **Maximum :100marks**
Answer All questions.
I. Elaborate on :   **(2 X 20=40)**

1. Describe the following concepts (a) accuracy and precision (b) round-off-error
   (c) addition and multiplication law of probability (d) Confidence intervals

2. (a) Evaluate $\int_0^1 dx/1+x^2$ using Simpson's three-eighth rule and compare with the
   solution (b) Explain about five properties of Chi-square distribution

II. Write notes on :   **(10X 6 = 60)**

1. Calculate the decay constant for cobalt-60 ($T1/2=5.26$yrs) in units of $month^{-1}$

2. What will be the activity of 5000 Ci of cobalt-60 source after 4years?
   ($A=A_0\, e^{-\mu t}$)

3. A treatment regimen with total dose of 20Gy must be given in two phases. The
   ratio of the dose in each phase is 3:1. What dose must be given for each phase?

4. In a certain residential area, a sample of 15 households showed the following
   incomes (in rupees) for the households:

1044	796	812	2100	902	600	796	
672	482	1828	2358	939	550	796	325

   Find out the mean, median and the mode for the sample.

                                                                    (PTO)

5. Explain about (a) Skewness (b) Kurtosis in detail

6. Use the Taylor series method of order four to solve the initial value problem
$$u' = t^2 + u^2, \; u\,(0) = 1$$

7. The two regression equations of X on Y and Y on X are given below:
    Y = 100.26 + 0.77 X; X = 1.28 Y – 143.7.
       Find out the means of X and Y.

8. Write a short note about (a) efficiency (b) sensitivity (c) signal-to-noise-ratio

9. Assuming the each child as probability 0.51 of being a boy, find the probability distribution of number of boys in a family of 4 children. In a sample of 500 couples how many do you expect to have.
    (i)   Exactly 1 boy
    (ii)   Exactly 1 girl
    (iii)   At least one boy?

10. Write a function to draw a circle of unit radius using MATLAB function. For generating data, use the parametric equation of a unit circle; $X = \cos\theta$, $Y = \sin\theta$, $0 \le \theta \le 2\pi$.

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M.Sc (MEDICAL PHYSICS) DEGREE EXAMINATION- MAY 2012
FIRST YEAR
PAPER II – RADIOLOGICAL MATHEMATICS
Q.P. Code: 284012

Time: Three hours   **Maximum: 100 marks**
      180(Min)

Answer ALL questions in the same order.

I. Elaborate on: **Pages Time Marks**
                                    (Max) (Max) (Max)

                                           (2 X 20=40)

1. a) Calculate Karl Pearson correlation coefficient for the following
       data   (15 + 5 =20 marks)

Age	30	32	35	38	42	44	45	51	55	65
Blood urea	25	30	44	34	38	32	30	44	40	45

    b) Discuss the assumptions of Karl Pearson correlation method?

2. a) A bag contains 10 Aspirin 5 Paracetamol 3 Analgin and 2
         Crocin tablets. One tablet is drawn at random. Find
         the probability that the tablet drawn is Aspirin or Analgin or
         Crocin.
       b) Discuss continuous probability distributions and discrete
         probability distributions.   (10 +10 =20 marks)

II. Write notes on:

1. Discuss measures of central tendency.   4   10   6

2. Prepare the decay chart for cobalt-60

   teletherapy isotope for the period of one half- life.   4   10   6

3. Define: i) law of large numbers ii) Central limit theorem.   4   10   6

4. A manufacturer of television sets knows that of an average 5% of
       his product is defective. He sales television in consignment of
       100 and guarantees that not more than 4 sets will be defective.
       What is the probability that a television set will fail to meet the
       guaranteed quality?   4   10   6

5. Calculate Mean, standard deviation for the following
   10 Diastolic blood pressure data:
   90 100 88 102 70 66 78 82 84 86.   4   10   6

6. What are the properties of t-distribution?   4   10   6

7. Define i) Minimum detectable activity

   ii) uncertainty in the counting rate.   4   10   6

8. Discuss binomial distribution.   4   10   6

9. Define signal to noise ratio.   4   10   6

10. Discuss Euler's method and modified Euler's method.   4   10   6

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FIRST YEAR
PAPER II – RADIOLOGICAL MATHEMATICS
Q.P. Code : 284012

Time : 3 hours   Maximum : 100 marks
       (180 Min)

Answer ALL questions in the same order.

I. Elaborate on :   **Pages Time Marks**
                                                         (Max.)(Max.)(Max.)

1. a) Find is their significant difference between diabetic persons
   cholesterol value and non-diabetic persons cholesterol value.   17   40   20
   t-table value=2.26.

Diabetic group	160	162	165	186	185	175
Non diabetic group	144	148	140	140	152	141

   b) Discuss the conditions for applying student t-test.

2. a) A study revealed that among 90 males 15 were obese and
   among 60 females 20 were obese. Use chi square test to find
   whether sex and obesity are associated.   17   40   20
   (χ^2=3.84 at 5% level)
   b) Discuss precautions for applying chi square distribution.

II. Write Notes on :

1. Discuss Correlation and regression.   4   10   6
2. Prepare the decay chart for cobalt-60 teletherapy isotope for
   the period of one half- life.   4   10   6
3. Discuss Euler's method and modified Euler's method.   4   10   6
4. Discuss linear graphs and nonlinear graphs.   4   10   6
5. Discuss Ranga-kutta method.   4   10   6
6. What are the properties of F-distribution.   4   10   6
7. Define i) Minimum detectable activity ii) uncertainty in
   the counting rate.   4   10   6
8. Discuss F- distribution.   4   10   6
9. Define signal to noise ratio.   4   10   6
10. Out of 800 families with 4 children each, how many families
    would be expected to have.   4   10   6
    (1) 2 boys and 2 girls   (2) no girl

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PAPER II – RADIOLOGICAL MATHEMATICS
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Time : 3 hours   **Maximum : 100 marks**

I. Elaborate on: (2x20=40)

1. a) Find the regression equation for the following data

Age	40	42	48	52	55	58	64	68	70	80
SBP	123	125	130	125	140	136	145	148	146	150

   b)   What are the uses of regression analysis ?

2. a) Find the probability that at most 5 defective fuses will be found in a box of 200 fuses if experience shows that 2% of such fuses are defective given that e^{-4} = 0.0183.
 b) Discuss difference between Binomial and Poisson distribution .

II. Write Notes on :   (10X6=60)

 1. Discuss differences between standard deviation and standard error.
 2. Define vector and scalar quantity, give examples.
 3. Define ratio. Treatment was planned to deliver total dose of 60Gy in three course of time. The dose planned to deliver in the ratio of 3:2:1.Calculate the dose delivered in each course and
    percentage of dose delivery.
 4. Calculate Geometric mean and Harmonic mean for the following quantities 8,16,48,64.
 5. What are the properties of the t-test.
 6. Define: i) Truncation error ii) Round-off error iii) Relative error.
 7. Discuss line symmetry and mirror symmetry.
 8. Calculate Mean, standard deviation for the following Diastolic blood pressure data: 93, 90, 95, 85, 90, 78
 9. Evaluate $\int_{-3}^{3} x^4 dx$ using i) Trapezoidal rule ii) Simpson's one-third rule.
10. Discuss Simple random sampling.

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[LD 1013]   **OCTOBER 2013**   **Sub. Code: 4012**
M.Sc (MEDICAL PHYSICS) DEGREE EXAMINATION
(Revised Regulations for Candidates admitted from 2010-2011)
FIRST YEAR
PAPER II – RADIOLOGICAL MATHEMATICS

Q.P. Code : 284012

Time : 3 hours   **Maximum : 100 marks**
Answer ALL questions
I. Elaborate on :   **(2X20=40)**

1. Discuss the assumptions of Karl Pearson correlation method?

2. Discuss on different types of distribution

II. Write notes on: **(10X6=60)**

1. Oscillations and Waves
2. Prepare the decay chart for Iridium-192 teletherapy isotope for the period of one half- life.
3. Presentation of Data
4. Regression
5. Statistical accuracy in double isotope
6. Newton Raphson Method
7. Testing of Hypothesis
8. Probability Sampling
9. MATLAB
10. Confidence interval

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