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**UT/APMAQP/1223/A 06-NOV-2023**

**UNIT TEST (2023-2024)**

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| **SUBJECT: Applied Mathematics**  **GRADE: XII** | **Maximum Marks: 50****Time Allowed: 2 Hours 30 Mins** |
| **General Instructions**:   1. This question paper consists of four sections**- A, B, C, D, E.** 2. Section **A** comprises of 10 questions of **1 mark** each**.** 3. Section **B** comprises of 4 questions of **2 marks** each**.** 4. Section **C** comprises of 3 questions of **3marks** each**.** 5. Section **D** Comprises of 3 questions of **5 marks** each. 6. Section **E** Comprises of 2 questions of **4 marks** which are case based.   (Logarithm table and graph paper are required) | |

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| **Section A**  **Each question carries 1 mark** | |
| **1.** | A die is thrown 6 times. If getting an odd number is a success what is the probability of 5 successes?   1. 1/64 ii) 5/64 iii) 3/32 iv) 5/32 |
| **2.** | What is the face value of a sinking fund that yields a dividend of Rs.2400 at 5% semi-annually?  (a) Rs.48000 (b) Rs.96000 (c) Rs.58000 (d) Rs.92000 |
| **3.** | Irregular variations in a time series are caused by  (a)Lockouts and strikes (c) Epidemics (b)Floods (d) All of these. |
| **4.** |  |
| **5.** | At what rate of interest will the present value of perpetuity of Rs 1500 payable at the end of every 6 months be Rs 20,000?  a) 12%p.a b) 15%p.a c) 5%p.a d) 7.5%p.a |
| **6.** |  |
| **7.** | The probability distribution of random variable is given as    The value of k is  a) 8 b) 16 c) 32 d) 48 |
| **8** |  |
|  | **ASSERTION-REASON BASED QUESTIONS** |
| **9** | **Assertion:** India and Pakistan are two equally capable Cricket teams with star performers. Probability that India beat Pakistan in world cup is 4 matches out of 5 is 31.25%  **Reason:** The probability of r success in n trails, denoted by P (X= r) is given by     1. Both A and R are true, and R is the correct explanation of A 2. Both A and R are true, but R is not the correct explanation of A 3. A is true but R is false. 4. A is false but R is true. |
| **10** | **Assertion (A):** Present value of an annuity whose periodic payment at the beginning for infinite periods, interest being r% per period or i per period per rupee is P=𝑅 + 𝑅 /𝑖  **Reason (R):** On adding all present values of payments, we get the present value of annuity which gives an infinite geometric series with a=𝑅 𝑎𝑛𝑑 𝑟 = 1/ 1+𝑖   1. Both A and R are true, and R is the correct explanation of A 2. Both A and R are true, but R is not the correct explanation of A 3. A is true but R is false. 4. A is false but R is true. |
|  | **SECTION B**  **This section comprises of very short answer type-questions (VSA) of 2 marks each** |
| **11.** | If the marginal revenue function of a firm in the production of output is MR = 40 – 10x2 where x is the level of output and total revenue is 120 at 3 units of output, find the total revenue function |
| **12** |  |
| **13.** | The population of a town grows at the rate of 10% per year. Using D.E find how long it will take for the population to grow 4 times? |
| **14.** | In a series of 3 independent trials, the probability of exactly 2 successes is 12 times as large as the probability of 3 successes. The probability of a success in each trail is |
|  | **SECTION C**  **(This section comprises of short answer type questions (SA) of 3 marks each)** |
| **15** | A machine costing Rs.50000 is to be replaced at the end of 10 years, when it will have a salvage value of Rs.5000. To provide money at the time for a machine costing the same amount, a sinking fund is set up. If equal payments are placed in the fund at the end quarter and the fund earns at the rate of 8% compounded quarterly, then what should each payment be? [Given (1.02)40= 2.208 ] |
| **16** | For a Poisson distribution model, if arrival rate of passengers at an airport is recorded 30 per hour on a given day. Find   1. The probability of 4 or fewer arrivals in the first 10 minutes of an hour. 2. The probability of 10 or more arrivals in an hour given that there are 8 arrivals in the first 10 minutes of that hour. [Given: e-5= 0.0067] |
| **17** | In a certain culture of bacteria, the rate of increase is proportional to the number present. It is found that there are 10000 bacteria at the end of 3 hours and 40000 bacteria at the end of 5 hours. How many bacteria were present in the beginning by integration. |
|  | **Section D**  **Qns. 32 to 35 carries 5 marks.** |
| **18.** |  |
| **19** | A loan of Rs.400000 at the rate of 6.75%p.a compounded monthly is to be amortized by equal payments at the end of each month for 10 years. Find   1. The size of each monthly payment 2. The principal outstanding at the end of 61st month. 3. Interest paid in 61st payment. 4. Total interest paid.   (Given (1.005625)120= 1.9603, (1.005625)60=1.4001 |
| **20.** | Two cards are drawn simultaneously from a well-shuffled deck of 52 cards. Find the probability distribution of the number of successes, when getting a spade is considered a success.  OR  From a lot of bulbs which includes 5 defective bulbs a sample of 4 bulbs are taken with replacement. Find the probability distribution of the defective bulbs. |
|  | **SECTION E-Case based.** |
| **21** | 1. The demand function 2. The supply function 3. Calculate the equilibrium point 4. The consumer surplus   **OR**  The producer surplus |
| **22** | . Mr. Anil Kumar runs a rice mill factory and the record of his productions (in metric tonnes) for the period of 2012- 2016 is as follows:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Year | 2012 | 2013 | 2014 | 2015 | 2016 | | Productions(tonnes) | 80 | 90 | 92 | 83 | 94 |   Based on the above information, answer the following questions. Show steps to support your answers.   1. By taking year 2014 as origin, use method of least-squares to find the best-fit trend line equation for Mr. Anil Kumar’s rice mill factory. Show the steps of your working. [2m]   **(OR)**  Demonstrate the technique to fit the best-suited straight-line trend by the method of 3-years moving averages. Also draw the trend line. [2m]  (b) Estimate the likely production of the rice mill factory during 2018? [1m]  (c) Mr. Anil Kumar’s wishes to grow his business to yearly production of 103tonnes. In which year will he be able to reach her target? |

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