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| **Scheme of Valuation/Answer Key**(Scheme of evaluation (marks in brackets) and answers of problems/key) |
| **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**FOURTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2019 |
| **Course Code: MA206** |
| **Course Name: PROBABILITY & STATISTICS AND NUMERICAL METHODS** **(BT, FT, MT)** |
| Max. Marks: 100 |  | Duration: 3 Hours |
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| **PART A**  |
|  |  | ***Answer any two full questions, each carries 15 marks.*** | Marks |
| 1 | a) | k=1/49 (2marks)P(X< 4)= 16/49 (2marks) (c) P(3 ≤ X≤ 6)= 40/49 (3 marks) | (7 ) |
|  | b) | $\frac{6-8}{4}$ is a mistake. So evaluator can give 8 marks to correct F(x) values in first 3 interval by$ F\left(x\right)=\left\{\begin{array}{c}0, x<0\\\frac{x^{2}}{16}, 0<\&x<2\\\frac{x-1}{4}, 2< \&x<4\\\frac{12x-x^{2}-20}{16}, 4<x<6\\1, x>6\end{array}\right.$(for calculating 0 and 1 ,1mark each. For other values 2 marks each) | (8 ) |
| 2 | a) |

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| X | 0 | 1 | 2 | 3 |
| f(x) | 1/6 | 1/2 | 3/10 | 1/30 |

(3 marks)P(X< 1)= 1/6 (2 marks)

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| X | 0 | 1 | 2 | 3 |
| F(x) | 1/6 | 4/6 | 58/60 | 1 |

(3 marks) | (8)  |
|  | b) | $f\left(x\right)=\frac{1}{20000}e^{x/20,000}, x>0 $ (1 mark)(i)P(X>10,000)= e-0.5 =0.6065 (3 marks)(ii) 1- P(X>10,000) = 1- e-0.5 =0.527 (3 marks) | (7) |
| 3 | a) | Proof - 7marks | (7) |
|  | b) | (a) P(70< X <72) =0.1554 , number of workers =155 (3 marks)(b) P(X >75) =0.1587 , number of workers =159 (3 marks)(c) P(X < 63) =0.0808 , number of workers =81 (2 marks) | (8) |
| **PART B**  |
| ***Answer any two full questions, each carries 15 marks.*** |
| 4 | a) | (i)explanation 2marks(ii) proof 5 marks | (7 ) |
|  | b) | Null hypothesis $H\_{0}: µ=1000$Against alternative hypothesis $H\_{1}: µ>1000$ (1 mark)critical region is $z>z\_{α}$ (1mark)$z=\frac{\overbar{x}-µ}{σ/\sqrt{n}}$= $\frac{1038-1000 }{146/\sqrt{64}}$ = 2.082 (4 marks)$z\_{α}$ =1.65 satisfies critical region . reject $H\_{0}$ (2 marks) | ( 8) |
| 5 | a) | $\overbar{x}$ follows $N(30 , 4/\sqrt{n})$ (1mark )$z=\frac{\overbar{x}-µ}{σ/\sqrt{n}}$ =$\frac{\overbar{x}-30}{4/\sqrt{n}}$ follows $N(0 , 1)$ (1mark )P{25<$\overbar{x}$<35}= 0.98 (1mark )Implies P{-2.33<$\overbar{x}$<2.33}= 0.98 (3marks )n= 3.47= 4 (2 marks) | (7 ) |
|  | b) | Null hypothesis $H\_{0}: µ>28000$ (1mark )Against alternative hypothesis $H\_{1}: µ<28000$ (1 mark)critical region is $z<-z\_{α}$ (1mark )$z=\frac{\overbar{x}-µ}{s/\sqrt{n}}$= $\frac{27463-28000 }{1348/\sqrt{40}}$= -2.52 (3 marks )$ z\_{α}$ =-2.33 $z<-z\_{α}$ reject $H\_{0}$ (2 marks) | (8) |
| 6 | a) | $z\_{α/2}$=1.65 (2 marks)Confidence interval is $\{\overbar{x}-z\_{α/2}σ/\sqrt{n}$, $\overbar{x}+z\_{α/2}σ/\sqrt{n}$} = (78.25,84.15) (5 marks) | (7) |
|  | b) | Null hypothesis $H\_{0}: µ\_{1 }= µ\_{2 }$ against $H\_{1}: µ\_{1 }\ne µ\_{2 }$(2 marks) Critical region is $\left|z\right|>z\_{α/2}$ (1 mark) $z=\frac{\overbar{x\_{1}}-\overbar{x\_{2}}}{σ\sqrt{\frac{1}{n1}}+\frac{1}{n2}}$= 1.79 (3 marks) $z\_{α/2}$=1.96 (1 marks) Accept $H\_{0}$ (1 mark)  | (8) |
| **PART C**  |
| ***Answer any two full questions, each carries 20 marks.*** |
| 7 | a) | $x\_{n+1}=x\_{n}-\frac{x\_{n}-2sinx\_{n}}{1-2cosx\_{n}} $(2 marks)$x\_{0}=2, x\_{1}=1.901, x\_{2}=1.89552, x\_{3}=1.89550, x\_{4}=1.89549$ (1 mark each) | ( 7) |
|  | b) | $x\_{0}=20, x=21 u=\frac{x-x\_{0}}{h}$= 0.333 (1 mark)Newton’s forward formula (1 mark)Difference table (3 marks)y(21) =0.3583 (2 marks) | ( 7) |
|  | c) | $x=\frac{1}{23}$ [29-13y-3z]$y=\frac{1}{23}$ [37-5x -7z] (1 mark)$z=\frac{1}{23}$ [43-11x –y]Put y=0, z=0After 5 iteration x= 0.4826, y= 1.01644, z=1.5946 (6 marks) | (7) |
| 8 | a) | Formula and substitution (2 marks)Polynomial y = x (4 marks) | (6) |
|  | b) |  Simpsons formula (1mark ) 53.87 (4 marks) , actual value 53.6 (2 marks) | (7) |
|  | c) |

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| n | $$x\_{n}$$ | $$y\_{n}$$ | $f(x\_{n,}y\_{n}$) | $y\_{n+1}=y\_{n}+hf(x\_{n,}y\_{n}$) |
| 01234 | 00.0250.050.0750.1 | 11.0251.05181.08061.1115 | 11.07561.15431.2366 | 1.0251.0518 1.08061.1115 |

 | (7) |
| 9 | a) | One root lies between 0 and 1 (1mark)$x=\sqrt{\frac{1}{1+x}}$= g(x) (1 mark)$\left|g^{'}\left(x\right)\right|<1 $ hence iteration method converges (1 mark)After 5 iterations x = 0.75488 (4 marks) | (7) |
|  | b) | $x\_{n+1}=x\_{n}-\frac{x\_{n}^{3}-41}{3x\_{n}^{2}} $(1mark)root lies between 3 and 4 (1mark)After 3 iterations $\sqrt[3]{41}$ =3.4482 (4 marks) | (6) |
|  | c) | Formula (2 marks)$k\_{1}=-0.1,k\_{2}=-0.09475$ $k\_{3}=-0.0950125 k\_{4}=-0.0894987 (3 marks) $$k=-0.0948372$ (1 mark)$y\left(0.1\right)= y\_{0}+k=0.9051627$ (1 mark) | (7) |