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QP Code 34441

S.Y.B.Sc.(SEM-III) Paper I –USST401 **SET-3**
All questions are compulsory.
Figures to the right indicate full marks.
Use of calculator is allowed.

Q.1			**Attempt all sub-questions: 2M each**	**(20)**
	a.		**State TRUE or FALSE and correct if necessary.**	(10)
		i.	True	
		ii.	True	
		iii.	False. For Normal distribution with parameters (μ= 5, σ^2=100) , μ_5 is 0.	
		iv.	False. X ~ Normal (μ = 18, σ^2= 25), then the ~~height~~ peak of the Normal probability curve is ~~highest~~ at 18.	
		v.	False. The mode of F distribution is always less than 1	
	b.		**Answer the following : 2M each**	(10)
		i.	f(x) = 1/10 $-5 < x < 5$ = 0 0therwise	
		ii.	X ~ Normal (μ = 32, σ^2 = 4), Q_3 = μ + 0.6745 σ = 33.349	
		iii.	X has MGF $\exp\{4t+18t^2\}$ X ~ Normal (μ = 4, σ^2 = 36)	
		iv.	Mean = 9 variance = 18	
		v.	Variance = 5/3	
Q.2			**Attempt any TWO sub-questions:**	**(20)**
	a.		M.G.F. = [e^{bt} - e^{at}] / t (b-a) .....3M μ_r^1 = [b^{r+1} - a^{r+1}] /(b –a) (r +1) ..... 3M Mean = (b+a) /2 ..... 2M Variance = (b –a) ^{2} /12 ..... 2M	(10)
	b.		If X ~ Gamma (a) M.G.F. = (1 – t) $^{-a}$ ..... 5M Mean = a ..... 2M Variance = a 3M	(10)
	c.		M.G.F. = $2/t^2$ { [e^{at} /(a-b)(a-c)] + [e^{ct} /(c-a)(c-b)] + [e^{bt} /(b-a)(b-c)]} 10M	(10)
Q.3			**Attempt any TWO sub-questions:**	**(20)**
	a.		X ~ Normal (μ , σ^2) Mean = E(X) = μ .....**5M** Variance = $E(X-\mu)^2 = \sigma^2$ **5M**	(10)

	b.		$X \sim \text{Normal}(\mu, \sigma^2)$ M.G.F.= $Mx(t) = e^{\mu t+\frac{1}{2}\sigma^2 t^2}$ .....**4M** C.G.F. = $\log_e Mx(t) = \mu t + \frac{1}{2}\sigma^2 t^2$ .....**1M** $\mu_1' = \mu$, $\mu_2 = \sigma^2$, $\mu_3 = 0$ $\mu_4 = 3\sigma^4$ .....**2M** Measures of skewness $\beta_1 = 0$, $\gamma_1 = 0$ symmetric Measures of kurtosis $\beta_2 = 3$ $\gamma_2 = 0$ mesokurtic **3M**	(10)
	c.	i.	$X \sim \text{Normal}(\mu_1, \sigma_1^2)$ $Y \sim \text{Normal}(\mu_2, \sigma_2^2)$ M.G.F.= $e^{\mu t+\frac{1}{2}\sigma^2 t^2}$ .....**1M** **Distribution of X+Y** $Mx+y(t) = Mx(t) \times My(t) = e^{\mu_1 t+\frac{1}{2}\sigma_1^2 t^2} \times e^{\mu_2 t+\frac{1}{2}\sigma_2^2 t^2}$ $= e^{(\mu_1+\mu_2)t+\frac{1}{2}(\sigma_1^2+\sigma_2^2)t^2}$ $X+Y \sim \text{Normal}(\mu_1+\mu_2, \sigma_1^2+\sigma_2^2)$ .....**2M** **Distribution of X-Y** $Mx-y(t) = Mx(t) \times My(-t) = e^{\mu_1 t+\frac{1}{2}\sigma_1^2 t^2} \times e^{\mu_2(-t)+\frac{1}{2}\sigma_2^2 t^2}$ $= e^{(\mu_1-\mu_2)t+\frac{1}{2}(\sigma_1^2+\sigma_2^2)t^2}$ $X-Y \sim \text{Normal}(\mu_1-\mu_2, \sigma_1^2+\sigma_2^2)$ **2M**	(05)
		ii.	$X \sim \text{Normal}(\mu, \sigma^2)$ Median = μ .....**1M** Mean deviation about median = $\sqrt{\frac{2}{\pi}}\,\sigma$ **4M**	(05)
Q.4			**Attempt any TWO sub-questions:**	**(20)**
	a.		Pdf ..... 1M M.G.F. = $(1-2t)^{-n/2}$ ..... 4M C.G.F. .....1M Mean = n ..... 2M Variance = 2n ..... 2M Where n is degrees of freedom	(10)
	b.		Derivation 10M	(10)
	c.		$\mu_r' = (f_2/f_1)^r \Gamma(f_1/2 + r)\,\Gamma(f_2/2 - r)/\Gamma(f_1/2)\,\Gamma(f_2/2)$ .....7 M Mean = $f_2 / f_2 - 2$ ..... 3M Where r.v. follows F distribution with (f_1, f_2) degrees of	(10)

			freedom.	
Q.5			**Attempt any TWO sub-questions:**	**(20)**
	a.		M.G.F. $= (\theta / \theta - t)$ C.G.F. $= \log_e (\theta / \theta - t)$ Mean $= 1/\theta$ Variance $= 1/\theta^2$	(10)
	b.	i.	$X \sim$ Normal (μ, σ^2) Mode of Normal distribution $= \mu$ **.....5M**	(05)
		ii.	Any five properties of Normal distribution with parameters of (μ,σ^2) **.....5M**	(05)
	c.		Mean deviation $= f^{n/2}\Gamma(f_1/2 - 1/2) / \Gamma(1/2)\,\Gamma(f/2)$ ....,,, 10M	(10)
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