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⊚ PES UNIVERSITY	**PES University** (Established under Karnataka Act No. 16 of 2013)	**UE18ME101**

END SEMESTER ASSESSMENT   B.TECH   SEMESTER I   DECEMBER 2018

UE18ME101 – MECHANICAL ENGINEERING SCIENCES

Time: 3 hours	Answer All Questions	Max. Marks: 100

1a)	What do you mean by *Biomass*?	**(2)**
1b)	In the context of Nuclear Energy generation, what are the items/ component mentioned below used for: 1. Control Rods 2. Moderators 3. Condenser 4. Heat Exchanger	**(4)**
1c)	Briefly explain, 1. *Tidal energy* 2. *Wave energy* 3. *Geo-thermal energy*	**(6)**
1d)	With a schematic sketch, explain the working principle of a simple *basin-type solar still / Solar Desalinator*	**(8)**
2a)	State the *Clausius Statement for the Second Law of Thermodynamics.*	**(2)**
2b)	State the *First Law of Thermodynamics* and its *limitations.*	**(4)**
2c)	Answer the following using the right terminology: 1. the item that connects the piston to the crankshaft is called _____? 2. any value that depends on the state of the system and not on its history is called _____? 3. the device which is used to mix the air and fuel together before letting it into the cylinder of an SI Engine is called _____? 4. the value of the total cylinder volume divided by clearance volume in the cylinder is called _____? 5. the ratio of the heating effect divided by work input is called _____? 6. the point on the cylinder farthest from the crank shaft where the piston changes direction of motion is called _____?	**(6)**
2d)	With schematic diagrams, explain *pressure compounding* and *velocity componding* used in Steam Turbines.	**(8)**
3a)	What do you mean by *Belt Creep*?	**(2)**
3b)	Explain the following with suitable diagrams. 1. *Rack and Pinion* 2. *Stepped cone pulley*	**(4)**

3c)	A V-belt drive is used to transmit power between two shafts. The power transmitted is 8000 W at a speed of 300 rpm. If the semi-groove angle of the V-belt is 20°, the mean radius of the grooved pulley is 500mm and the angle of lap is 160°, calculate the tensions on the either sides of the belt. (μ = 0.25)	(6)
3d)	A compound gear train is formed by 4 gears *P, Q, R* and *S*. Gear *P* meshes with gear *Q* and gear *R* meshes with gear *S*. Gear *Q* and *R* are compounded. *P* is connected to the driving shaft and *S* is connected to the driven shaft and power is transmitted. The details of the gears are: | Gears	P	Q	R	S
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No. of Teeth	30	60	40	80 | If the gear *S* were to rotate at 60 rpm, calculate the speeds of the other gears. What is the Train Value? Also sketch the gear train arrangement. If gear *Q* is rotating in the ant-clockwise direction, in what direction would gear *S* rotate?	(8)
4a)	What is *Modulus of Rigidity*?	(2)
4b)	A polystyrene rod of length 240 mm and diameter 15 mm is subjected to a 2.8 kN tensile load. Knowing that E=2.9 GPa, determine, (a) the elongation of the rod (b) the normal stress in the rod	(4)
4c)	Draw the stress-strain diagram for Aluminium and explain the process of finding its yield point.	(6)
4d)	A 1.5m tall pillar of triangular cross section with sides 30 cm is made of cement. To improve its load bearing capacity, 3 steel rods of diameter 2.5cm have been used to reinforce it. Determine the normal stresses in steel and in concrete when a 1600 kN axial centric force P is applied to the post. Assume E_s = 200 Gpa and E_c = 25 GPa	(8)
5a)	What is *cold shut*?	(2)
5b)	Explain briefly the following properties of moulding sand: 1. *Refractoriness* 2. *Adhesiveness* 3. *Cohesiveness* 4. *Permeability*	(4)
5c)	Distinguish between n*eutral, c*arburising and o*xidising flames* seen in Oxy-Acetylene welding. Explain each based on its physical appearance.	(6)
5d)	Explain the following with suitable schematic diagrams. 1. *Counterboring* 2. *Blanking* 3. *Facing* 4. *Extrusion*	(8)

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