			Reg. No.											
MANIPAL INSTITUTE OF TECHNOLOGY								7						
1	1 <sup>st</sup> SEMESTER M.Tech (BME) DEGREE END SEM EXAMINATIONS NOVEMBER 2017													
	SUBJECT: BIO-INSTRUMENTATION (BME 5102)													
	(REVISED CREDIT SYSTEM) Setundar, 18th Nevember 2017, 0 AM to 12 NOON													
TIM	TIME: 3 HOURS MAX. MARKS: 100													
			Instructions	s to C	Cand	idate	s:							
Ans	wer A	ALL questions												
1.	(a)	(i) Explain in detail, a n oxygen saturation in the ar	on-invasive terial blood.	metl	nod	of de	eterm	ining	g the p	oerc	enta	ge o	f	(5)
		(ii) Differentiate 'Thorpe' Discuss the working princ	flowmeter f	rom of the	the 'je abo	press ve ty	ure o pes o	comp of flo	ensated wmeter	d' f rs.	lown	neter	. (	2+4)
	(b)	(i) Calculate the sound pres	ssure level (i	n dB	) of a	ı sub	ject,	if the	e measu	irec	1			(2)
	(-)	sound pressure is 0.06Pa and	nd the thresh	old c	of noi	mal	heari	ing is	20µPa	ì.				(-)
		(ii) Differentiate 'SRT' tes	t from 'speed	ch Di	iscrin	ninat	ion'	test i	n audic	me	etry.			(3)
	(c)	Identify and explain the typ poor air conduction and be	pe of hearing	g aid on he	that c earing	could g los:	be u s.	ised f	for subj	ject	s wit	h		(4)
2.	(a)	(i) Differentiate ventricul	lar-programm	ned	from	atri	al-pi	ogra	mmed	pa	.cema	akers	s. (	2+3)
		Discuss the structure of two (ii) Calculate the energy d specifications: pulse width Assume $R_h=150\Omega$ and $I_d=1$	o basic types elivered by = 0.2msec, j 1.3µA.	s of c each pulse	ardia puls peri	c pac e fro od =	cema m a 1 sec	ker e pace c, pul	lectrod maker se amp	les. for olitu	the ide =	givei 6V.	n	(3)
	(b)	(i) Give an example of a draw the energy-level diag mentioned laser.	gaseous ion gram depicti	lasen ng th	r and e tra	exp nsitio	lain ons a	the s ssoci	ame in ated w	de ith	tail. the a	Also abov	), () e	4+2)
		(ii) What is the ratio of He adding Helium in the active	e and Ne gas e medium of	in th this	ne He laser	e-Ne ?	laser	·? WI	hat is tl	ne p	ourpo	ose o	f	(2)

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(c) With a neat figure, explain the augmented unipolar limb lead configuration. How (2+2) can the augmented voltages be obtained from the standard lead voltages?

- 3. (a) (i) A platinum resistance thermometer has a resistance of 100Ω at 25°C. Find its resistance at 50°C. The resistance temperature coefficient of platinum is 0.00392 Ω/°C. If the thermometer has a resistance of 200Ω, calculate the value of temperature.
  (ii) Compare RTD with thermistors.
  (2)
  (iii) Choose the most suitable temperature transducer for measuring the temperature, corresponding to each of the following cases: very small change; wide variations; highly accurate temperature measurement.
  - (b) (i) Differentiate primary transducers from secondary transducers. (2)

(ii) The relay in the following figure, is to be controlled by a photoconductive cell. The potentiometer delivers 10mA at a 30V setting when the cell is illuminated with a 4001/m2 and is required to be de-energized when the cell is dark. Calculate the required series resistance and the ark current level. [Assume the cell resistance to be 1 K $\Omega$  at 400 l/m<sup>2</sup> and 100K $\Omega$  at 1 l/m<sup>2</sup>] (3)



	(c)	(i) Explain in detail as to how ultrasound can be used to measure the velocity of flowing blood.	(4.5)
		(ii) Write a note 'wireless endoscopy'.	(2.5)
4.	(a)	(i) Define 'electrode potential' of a metal. How is it affected by temperature?	(2)
		(ii) Explain any two methods of manufacturing the Ag/ AgCl electrode. What is the potential generated by the Ag/AgCl electrode when 1M KCl solution is used as the electrolyte?	(3+1)
	(b)	<ul><li>(i) Compare the different types of oxygenators used in the heart/ lung machine.</li><li>(ii) Compare the 'blood transit time' and 'blood film thickness' values of the natural lung with that of artificial lung.</li></ul>	(5)

(2)

- (c) (i) The maximum sound intensity that the ear can tolerate at 1KHz is approximately 1W/m<sup>2</sup>. What is the maximum displacement in air corresponding to this intensity (Z=430 for air)?
  (ii) Explain the different phenomena that can take place when ultrasound interacts with tissue.
- 5. (a) (i) What is peritoneal dialysis? Explain the principle of this method and mention (3+2) the advantages and disadvantages of this method.
  (ii) Define the following terms: a) Fulguration b) Sonotrode c) Delirium (4) d) Hysteroscope
  - (b) Mention the advantages of placing the vaporizer inside the circle circuit of the (1+4) anesthesia machine and explain in detail the closed circle anesthesia machine with the vaporizer inside the circle circuit.
  - (c) Describe the 10-20 system of electrode placement in EEG measurement and the different types of electrode connections that can be used in the EEG recording system. (3+3)