Seat No. of Pages : 12

M.Phil./Ph.D. Entrance Examination, October - 2018 ENVIRONMENTAL ENGINEERING / ENVIRONMENTAL SCIENCE AND ENGINEERING

Day and Date: Tuesday, 09 - 10 - 2018 Total Marks: 100

Time: 12.00 noon to 02.00 p.m.

Instructions:

- 1) All questions are compulsory.
- 2) Each question carries 2 marks.
- 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
- 4) Use black pen only for marking the circle. Do not make any stray mark on the Answer Sheet.
- 5) Follow the instructions given on OMR Sheet.
- 6) Rough work should be done on the sheet provided at the end of question paper.
- 7) Only non-programmable calculators are allowed.

Paper - I

- 1) Slightly soluble gases such as oxygen and nitrogen encounter more resistance in:
 - A) Gas film

B) Liquid film

C) Both gas and liquid films

- D) Neither gas film nor liquid film
- 2) In a water having low colloidal concentration the predominant mechanism of coagulation is
 - A) Adsorption and charge neutralization
 - B) Sweep coagulation
 - C) Both A and B
 - D) Inter-particle bridging

	B)	Dei	Denitrification						
	C)	Bot	th nitı	rificat	tion and	denitrif	ication		
	D)	An	aerob	oic de	compos	ition			
4)		atch List I with List II and select the correct answer using the code give low the lists:							
			Lis	t - I					List - II
		(AI	PC E	quipn	nent)				(Pollutant removed)
	a)	ES	P					1.	Coarse particles
	b)	Cy	clone	S				2.	Fine dust
	c)	We	t scru	ıbber				3.	Gas
	d)	Ad	sorbe	ers				4.	Sulphur dioxide
	Cod	e: a	b	c	d				
	A)	2	1	3	4				
	B)	1	2	3	4				
	C)	2	1	4	3				
	D)	1	2	4	3				
5)	Whi	ich o	fthe	follo	wing sta	tements	s relate	d to	C/N ratio are correct?
	i)			nitial nposi		io leads	to loss	of n	itrogen and slows down the rate
	ii)	Hig	gher i	nitial	C/N rat	io leads	to cell	dest	ruction to obtain nutrition;
	iii)	_	gher (atio lead	ls to lov	wer con	serv	ration of nitrogen in the finished
	iv)	An	initia	al rati	o of 30 t	to 50 is	optima	l for	composting;
	A)	i, ii	, iii ar	nd iv				B)	i, ii and iii
	C)	i, ii	i and	iv				D)	ii, iii and iv

Rising sludge problem is caused by

A) Nitrification

3)

	A) Combustion property of solid waste								
	B)	Composition of solid waste							
	C)	Combustion property of liquid waste							
	D)	Composition of liquid waste							
7)	Amongst the various sewage treatment methods, for the same discharge, the smallest volume is needed for:								
	A)	Oxidation pond							
	B)	Oxidation ditch							
	C)	Aerated lagoon							
	D)	Aeration tank of conventional activ	ated	sludge process					
8)	The minimum solid waste compaction ratio reported by the manufacturer of a high-pressure compaction machine is 8:1. The corresponding percent volume reduction of the solid waste is								
	A)	88.88	B)	87.5					
	C)	12.50	D)	11.12					
9)	An ambulance siren causes a sound pressure of 200 μbar. Use a reference sound pressure 0.0002 μbar. The sound pressure level of the siren is								
	A)	120 dB	B)	200 dB					
	C)	6 dB	D)	230 dB					
	Data for Q.10 and 11 :								
	A uniform filter medium 0.65 m deep has a porosity of 0.4. The sand particle has settling velocity is 0.07 m/s. The sand bed is to be expanded by hydraulic backwash								
10)	10) The backwash velocity required for expanding a uniform bed of sand porosity of 0.7 is								
	A)	0.016 m/s	B)	0.0138 m/s					
	C)	0.00138 m/s	D)	0.012 m/s					

Proximate analysis is carried out to determine

M/P ENT - 14711) The height of sand bed after expansion to porosity of 0.7 is A) 1.3 m B) 1.0 m C) 0.9 m D) 1.2 m Data for Q.12 and 13: Raw sludge has moisture content of 99% and after thickening its moisture content is reduced to 96%. 12) The reduction in volume of sludge is 25% A) 3% B) C) 97% D) 75% 13) The reduction in mass of solids is 3% 0% A) B) C) 100% D) 75% Data for Q.14 and 15: A settled sewage of 5 mld flow with BOD of 120 mg/L is applied to 1.5 m deep low rate trickling filter with an organic loading of 12000 kgBOD/ha.m.d. **14)** The hydraulic loading on the filter is 150 mld/ha 120 mld/ha A) B) C) 300 mld/ha D) 125 mld/ha

B) 500 m^2

D) 400 m^2

15) The area of trickling filter is

A) 364 m^2

C) 333 m^2

Data for Q.16 and 17:

The volume occupied by 2 mol of gas at 25°C and 820 mm Hg is to be determined.

16) The volume occupied by 1 mol of gas at STP is

A) 24.2 L

B) 22.4 L

C) 35.2 L

D) 20.2 L

17) The volume occupied by 2 mol of gas at 25°C and 820 mm Hg is

A) 55.32 L

B) 45.32 L

C) 35.32 L

D) 65.32 L

Data for Q.18 and 19:

A baghouse receives 15 m³/s of air and the filtering velocity to be maintained is 2 m/min. The filter bags available have 0.3 m in diameter and 6 m long.

18) The total cloth area required in m² is

A) 45

B) 450

C) 133.33

D) 13.33

19) The number of filter bags required are

A) 8

B) 80

C) 24

D) 3

Data for Q.20 and 21:

A town having population of 50,000 produces solid waste at the rate of 0.60 kg/cap.d. The density of solid waste in the landfill is 350 kg/m³.

20) Yearly generation of solid waste

A) 10950 t

B) 30 t

C) 1095 t

D) 300 t

- 21) The landfill area required per year for average depth of 5 m is
 - A) 3832 m^2

B) 2100m²

C) 4285 m^2

D) 6257 m²

Data for Q.22 and 23:

Settling test on a sample drawn from aeration tank liquor of ASP (MLSS=2500 mg/L) was carried out with 1 liter sample. The test yielded a settled volume of 300 mL.

22) The sludge volume index shall be

A) 30

B) 120

C) 25

D) 83.33

23) The sludge density index shall be

A) 3.33

B) 0.83

C) 4.00

D) 1.20

Data for Q.24 and 25:

In the treatment of 25×10^3 m³/d of water, the amount of chlorine used is 15 kg/d. The residual chlorine after 10 min. contact is 0.20 mg/L.

24) The applied chlorine dose is

A) 0.6 mg/L

B) 1.66 mg/L

C) 0.20 mg/L

D) 1.5 mg/L

25) The chlorine demand is

A) 1.46 mg/L

B) 0.4 mg/L

C) 0 mg/L

D) 1.3 mg/L

Paper - II (Research Methodology)

26)	26) The data collected by a researcher is divided based on quality, quanti repeatability. Some of this data is further selected using the random digit This is technically called as						
	A)	Structured sampling	B)	Stratified sampling			
	C)	Representative sampling	D)	Stratified random sampling			
27)	Formulation of hypothesis may NOT be required in :						
	A)	Survey method	B)	Historical studies			
	C)	Normative studies	D)	Experimental studies			
28)	Attri	ibutes of objects, events or things w	hich	can be measured are called			
	A)	Data	B)	Variables			
	C)	Qualitative measure	D)	All of these			
29)	Fact	orial Analysis is used to :					
	A)	test the Hypothesis					
	B) know the difference between two variables						
	C) know the relationship between two variables						
	D) know the difference among the many variables						
30)	The research that applies the laws at the time of field study to draw more an more clear ideas about the problem is:						
	A)	Experimental research	B)	Applied research			
	C)	Action research	D)	None of these			

31) Bibliography given in a research report:
A) has no relevance to research
B) shows vast knowledge of the researcher
C) helps those interested in further research

all the above

- **32)** Which of the following measure of central tendency is appropriate for analyzing nominal data?
 - I. Mean, II. Mode, III. Median and IV. Range.

Select the correct answer using the codes given below:

A) I only

D)

B) II only

C) II and III

D) I and II

- **33)** Validity of research can be improved by
 - A) Taking true representative sample from the data
 - B) Considering extraneous factors
 - C) Both A and B
 - D) Neither A nor B
- **34)** The significant result in a chi-square test implies that
 - A) Homogeneity of variance has been established
 - B) Homogeneity of variance has not been established
 - C) Sample is representative of the data
 - D) Sample is not representative of the data
- **35)** There are two types of error associated with testing of hypothesis viz. type I and type II. Type I error occurs when
 - A) The null hypothesis is rejected even though it is true
 - B) The null hypothesis is accepted even though it is false
 - C) Both the null hypothesis as well as alternative hypothesis are rejected
 - D) None of the above

36)	The term used in experimental research					
	A)	Experimental group	B)	Controlled group		
	C)	Both A and B	D)	No such terms are used		
37)	The method of controlling adopted for conducting experiment on a large dais/are					
	A)	Elimination	B)	Randomization		
	C)	Matching and elimination	D)	Both A and B		
38)	Whi	ch is the critical stage in research pr	ocess	s?		
	A)	Literature survey				
	B)	Problem formulation				
	C)	Experimental work				
	D)	Results, analysis and conclusions				
39)	Whi	ch type/s of article can be published	in jo	ournals?		
	A)	Review	B)	Discussion		
	C)	Both A and B	D)	None of these		
40)	Tipr	oit table refers to				
.0,	A)	Table of random digits				
	B)	Table used in sampling methods				
	C)	Table used in statistical investigation	ons			
	D)	All the above	-10			
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M/P ENT – 147

41)	I) Interview with a detailed schedule is called structural interview.							
	II)	Interview with a detailed schedule is called direct interview.						
	Choose the correct answer							
	A)	Both I and II are correct	B)	Both I and II are incorrect				
	C)	I is correct and II is incorrect	D)	I is incorrect and II is correct				
42)	A research paper is a brief report of research work based on							
,	A)	Primary Data only	B)	Secondary Data only				
	C)	Both Primary and Secondary Data	D)	None of the above				
43)	Rese	earch is not considered ethical if it						
	A)	is not of a very high standard						
	B)	tries to prove a particular point						
	C)	does not investigate the data scienti	ficall	у				
	D)	does not ensure privacy and anonymity of the respondent						
44)		Then two or more successive footnotes refer to the same work which one of e following expressions is used?						
	A)	et.al	B)	op.cit				
	C)	loc.cit	D)	ibid				
45)	Ex F	Post Facto research means						
	A)	The research is carried out after the	inci	dent				
	B)	The research is carried out prior to	the in	ncident				
	C)	The research is carried out along w	ith th	e happening of an incident				
	D)	The research is carried out keeping i	n mi	nd the possibilities of an incident				

M/P ENT – 147

46)	Which one of the following is an indication of the quality of a research journal?					
	A)	h-index	B)	g-index		
	C)	i10-index	D)	Impact factor		
47)	The	sequential operations in scientific re	searc	ch are		
	A)	Elimination of Spurious Relations, Th	eoris	ation, Generalisation, Co-variation		
	B)	Theorisation, Generalisation, Elimina	tion c	of Spurious Relations, Co-variation		
	C)	Co-variation, Elimination of Spurious	Rela	tions, Generalisation, Theorisation		
	D)	Generalisation, Co-variation, Theorisa	ation,	Elimination of Spurious Relations		
48)	The	Principles of fundamental research	are us	sed in		
	A)	Action research	B)	Applied research		
	C)	Historical research	D)	Philosophical research		
49)	In th	n the purposive method of sampling design, items are selected according to				
	A)	Personal judgement	B)	Law of probability		
	C)	Law of certainty	D)	None of the above		
50)	Eval	luation research is concerned with				
	A)	Why are we doing?				
	B)	What are we doing?				
	C)	How well are we doing?				
	D)	None of the above				



M/P ENT – 147

Rough Work