

B.E. Mechanical Engineering - First Year - Second Semester (Old)
EXAMINATION, 20 17
 (1st/2nd Semester/Repeat/Supplementary/Annual/Bi-Annual)

SUBJECT..... Electrical Technology-II
 (Name in full)

PAPER.....

Time : ~~Two hours~~/~~Three hours~~/~~Four hours~~/~~Six hours~~

Full Marks 100
 (50 marks for each part)

Use a separate Answer-Script for each part

No. of questions		Marks
	<u>Answer any six questions (6 × 16) , four marks for organized answer</u>	
1. a)	Mention clearly the functions of following equipments in thermal power plant- (i) Boiler Feed Pump (ii) Coal Mill (iii) Condenser (iv) HP Heaters (v) Deaerator (vi) Force Draught Fan	9
b)	What is the main operational principle of hydro-electric power station?	5
c)	What are the disadvantages of nuclear power station?	2
2. a)	Load curve can be drawn from load duration curve but vice versa is not possible –Justify , or do necessary corrections, if required.	6
b)	A Generating Station has the following daily load schedule Time(hours) (0-8) (8-12) (12-16) (16-18) (18-20) (20-24) Load (MW) 75 85 100 60 130 60 Find out - (i) Maximum demand (ii) Energy generated per day (iii) Average load (iv) Load factor Draw the load curve from the above data. Hence draw the load duration curve from it.	10
3 a)	Explain the physical significance of resistance (R) , inductance (L) , capacitance (C) parameters in an overhead transmission line.	6

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b)	Classify transmission lines on the basis of length & line voltage.	4
c)	Write a short note on "Availability Based Tariff" (ABT)	6
4. a)	Explain Radial, Ring Main & Interconnected system of AC distribution with advantages & disadvantages of each other.	12
c)	"The amount of light reaching on a surface (Illuminance) is more important than the light coming out of the light source" - Justify	2
d)	Which motor is best suitable for traction system?	2
5 a)	Draw the schematic diagram of distribution of unit auxiliary power from a generator to the unit bus. Hence explain the interlocking arrangements with station bus	10
b)	What is Ferranti Effect of long & lightly loaded transmission line? Explain it with phasor diagram.	6
6 .	Explain the four quadrant operation of a motor drive. What do you mean by active torque?	16
7.	Explain the different braking methods of electrical drives.	16
8.	With the help of circuit diagram explain the operation of starting of an Induction motor by capacitor Start split phase method.	16
9.	Write in brief about electrical heating and its advantages in details.	16
10.	Write short note on i) Indirect Arc Furnace ii) Lead Acid Batteries	16

BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING EXAMINATION, 2017

(2nd Year, 2nd Semester)

MATHEMATICS IV

Time : Three hours

Full Marks : 100

(50 marks for each part)

Use a separate Answer-Script for each part

PART - IAnswer any *five* questions

1. a) Define subspace of a vector space V over a field F . Prove that $W_1 = \{(a_1, a_2, \dots, a_n) \in \mathbb{R}^n \text{ such that } a_1 + a_2 + \dots + a_n = 0\}$ is a subspace of \mathbb{R}^n but $W_2 = \{(a_1, a_2, \dots, a_n) \in \mathbb{R}^n / a_1 + a_2 + \dots + a_n = 1\}$ is not.
- b) Prove that intersection of two subspaces of a Vector space is a subspace. Is it true for union ? Justify. 6+4
2. a) Prove that a linearly independent set of vectors in a finite dimensional vector space V over a field F is either a basis of V or can be extended to a basis of V .
- b) Find a basis and the dimension of the subspace W of \mathbb{R}^3 , when

$$W = \{(x, y, z) \in \mathbb{R}^3 : x + 2y + z = 0, 2x + y + 3z = 0\}$$
6+4
3. a) Prove that $|\langle \alpha, \beta \rangle| \leq \|\alpha\| \|\beta\|$. Hence prove that $\|\alpha + \beta\| \leq \|\alpha\| + \|\beta\|$.
- b) If $\beta_1 = (3, 0, 4)$, $\beta_2 = (-1, 0, 7)$ and $\beta_3 = (2, 9, 11)$ are in \mathbb{R}^3 equipped with the standard inner product, use Gram-Schmidt process to obtain orthogonal basis of \mathbb{R}^3 from $\beta_1, \beta_2, \beta_3$. 5+5
4. a) Determine the linear mapping $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ which maps the basis vectors $(0, 1, 1)$, $(1, 0, 1)$ $(1, 1, 0)$ of \mathbb{R}^3 to the vectors $(2, 0, 0)$, $(0, 2, 0)$, $(0, 0, 2)$ respectively. Find $\ker T$ and $\text{Im} T$.
- b) If V and W are two vector spaces over the same field F and V is finite dimensional then prove that $\text{nullity of } T + \text{rank of } T = \dim V$, where $T: V \rightarrow W$ is a linear transformation. 5+5

[Turn over