Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKEUP EXAMINATIONS, DEC 2016 - JAN 2017

SUBJECT: ILLUMINATION TECHNOLOGY [ELE 405]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 30 December 2016** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A.	Compare cone vision and rod vision, in terms of lighting levels and discrimination of finer details in the visual field.	**4**
1B.	Define and explain the terms i) Luminance. ii) Illuminance. Also, show their relationship.	**3**
1C.	What is meant by refraction? How is it important for lighting applications?	**3**
2A.	An industrial high bay luminaire has photometric characteristics as given in Table 1 below. It is mounted at a height of 8m above the ground level aiming at point 'Q' 10m away from its base. Find horizontal illuminance and luminance: a) At the point 'Q'. b) At point 'P' which is at midway between the line joining the base of the lamp and point 'Q'.	**3**
2B.	Filament of an Incandescent lamp is 0.005cm in diameter and 70cm long. It consumes 180W operating at 230V AC. Assuming filament to be black body radiator, determine a) Temperature at which filament is operating. b) If the maximum radiant exitance happens at 555nm, what will be the operating temperature? c) Find the temperature range in which the source acts as an efficient light source.	**3**
2C.	With relevant diagrams, explain the ray patterns for "circular" and "parabolic" reflectors. Mention applications of these reflectors.	**4**
3A.	What is incandescence? What is the significance of selecting tungsten as filament material for incandescent lamps?	**3**
3B.	Explain color temperature, co-related color temperature and color rendering index with the help of CIE chromaticity diagram and black body locus. Give examples.	**4**
3C.	With the aid of neat sketches, explain the construction and principle of operation of Metal Halide Lamps.	**3**
4A.	Explain with neat sketches, the four basic techniques used for the measurement of photometric characteristics of a luminaire using Gonio photometer?	**3**

4B. For the industrial high bay luminaire with details and photometric characteristics given in Table 1 below find the light output ratios and flux fraction ratios considering 5 degree zones. **4**

4C. What is as IES file? What is importance of an IES file with respect to lighting design aspect? **3**

5A. Explain with relevant examples the important factors to be considered in Road lighting. **3**

5B. An automobile warehouse 30m (L) x 30m (W) x 8m (H) requires a service illuminance of 500 lux on the floor level. Design a lighting scheme for the warehouse making use of the luminaire given in Table 1 below. Assuming a maintenance factor 0.8 and utilization factor of 0.65. Also calculate the "Lighting Power Density" for the interior. **4**

5C. What is Glare? What are the different types of glare? How can glare minimized in an interior? **3**

6A. What is the importance of "No-sky Line" in daylighting? **3**

6B. Estimate the number and size of the flood lighting projectors required to illuminate the upper 75m of one face of a 96m clock tower of 13m wide to initial luminance level of 6.85 cd/m^2. The projectors are to be mounted at a ground level 51m from the base of the tower. C.U = 0.4, W.L.F = 1.2, D.F = 1.3. Assume Reflection factor of wall to be 25%.

The photometric data of the lamp is given in Table 1. Comment on the beam spread of the projectors. **4**

6C. Explain the basic rules to be followed in providing energy efficient lighting solution. **3**

Table 1 : Photometric data of Industrial High Bay, Open Type with Aluminium reflector having 175W Metal Halide lamp, with a circular luminous opening of diameter 36cm.
Ballast Wattage: 41W, Spacing to Mounting height Ratio : 1.54, Rated Lumens/lamp: 14400 lumens

γ in deg	0	5	10	15	20	25	30	35	40	45
I (Cd)	282	269	257	254	262	284	309	321	305	261
γ in deg	50	55	60	65	70	75	80	85	90	
I (Cd)	191	138	72	30	16	8	4	1	0	